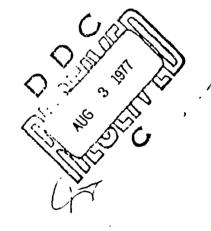


TECHNICAL REPORT TG-77-18

ASSESSMENT OF A DYNAMICAL GYROSCOPE MODEL UTILIZING DIGITAL SIMULATION TECHNIQUES

Guidance and Control Directorate Technology Laboratory

3 June 1977





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therefore,

$$\theta(t) = \frac{H}{J} \int_0^t \psi(t) dt$$

A similar derivation holds for the other axis; i.e., a transfer function relating  $\theta$  and  $\psi$  can be interchanged so that

$$\frac{\Psi(s)}{\theta(s)}$$

The "ideal" model (Section III.A), behaves like a perfect gyroscope. The "dynamic" gyroscope is far more complicated with realistic inertia and damping terms being considered. A 2-DOF dynamic gyro is represented by two second order differential equations as given in Section III.B.

# III. MATHEMATICAL GYRO MODELS

The mathematical formulation of the two gyroscope models is given in the following paragraphs.

#### A. Ideal 2-DOF Gimballed Gyroscope

Figure 1 describes the orientation of the seeker gyro coordinate system  $(x_s, y_s, z_s)$  by using the seeker Euler angles  $\theta$  and then  $\psi$  with respect to the body coordinate system  $(x_B, y_B, z_B)$ . The gyro coordinate system is chosen so that the origin is at the center of mass of the gyro and the  $x_s$ -axis is the axis of symmetry of the gyro. Also let  $\omega'$  be the absolute angular velocity or rate of the seeker gyro. Then the general expression for components of angular momentum H of the gyro is

$$H_{x} = I_{xx} \omega_{x}^{1}$$

$$H_y = I_{yy} \omega_y^{\prime}$$

$$H_z = I_{zz} \omega_z^{\dagger} \qquad . \tag{1}$$

Let  $\omega$  be the absolute angular velocity of the  $x_s$ ,  $y_s$ ,  $z_s$  system and s be the angular velocity or spin rate of the gyro as measured relative to the  $x_s$ ,  $y_s$ , s, system. Then the angular velocity terms  $(\omega_x', \omega_y', \omega_z')$  are

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#### I. INTRODUCTION

A gimballed two-degree-of-freedom (DOF) attitude gyro whose spin axis is torqued to a point along the line-of-sight (LOS) is a primary guidance device used in today's missile technology. LOS rate for proportional navigation guidance (PNG) is derived from this type of gyro. The guidance law for this scheme is PNG. The missile used here is tail controlled with proportional vane deflection and roll rate controlled. When the missile is near enough to the target to be seen by the guidance device (seeker) which is mounted on the gyroscope, an LOS error (the difference as measured in both yaw and pitch plane of where the seeker is presently pointing and where it should be pointing) is computed. This LOS error torques the gyroscope and eventually drives the missile body vanes which turn the body into line with the pointing seeker. Missile targeting accuracy is described for two types of 2-DOF gimballed gyros (idealized and dynamic) models when implemented in a 6-DOF digital missile simulation with no changes in airframe, aero, autopilot, and guidance law.

#### II. PROBLEM DEFINITION

For many studies using digital simulation, it is desirable to model a gyro which has no second order (inertia) and damping terms in the mathematical formulation. This model is one represented by a perfect integrator, 1/s, in the Laplace notation. The following paragraphs display the rationale in developing such a model.

The differential equation relating output axis motion to input torque or rate is

$$J\ddot{\theta} + B\dot{\theta} + K\theta = H\dot{\psi}$$

Laplace transformation with zero initial conditions is applied

$$\frac{\Theta(s)}{\Psi(s)} = \frac{Hs}{Js^2 + Bs + K}$$

and it is assumed that  $J \gg B$  and  $J \gg K$ 

$$\frac{\Theta(s)}{\Psi(s)} = \frac{Hs}{Is^2} = \left(\frac{H}{J}\right) \frac{1}{s} \qquad ;$$

therefore,

$$\theta(t) = \frac{R}{J} \int_0^t \psi(t) dt$$

A similar derivation holds for the other axis; i.e., a transfer function relating  $\theta$  and  $\psi$  can be interchanged so that

$$\frac{\Psi(s)}{\theta(s)}$$

The "ideal" model (Section III.A), behaves like a perfect gyroscope. The "dynamic" gyroscope is far more complicated with realistic inertia and damping terms being considered. A 2-DOF dynamic gyro is represented by two second order differential equations as given in Section III.B.

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The mathematical formulation of the two gyroscope models is given in the following paragraphs.

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$$H_x = I_{xx} \omega_x'$$

$$H_y = I_{yy} \omega_y'$$

$$H_{z} = I_{zz} \omega_{z}^{\prime} \qquad . \tag{1}$$

Let  $\omega$  be the absolute angular velocity of the  $x_s$ ,  $y_s$ ,  $z_s$  system and s be the angular velocity or spin rate of the gyro as measured relative to the  $x_s$ ,  $y_s$ ,  $x_s$  system. Then the angular velocity terms  $(\omega_x^i, \omega_y^i, \omega_z^i)$  are

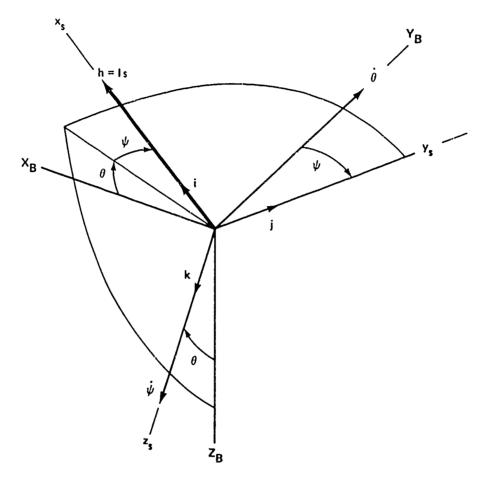


Figure 1. Seeker gyro coordinate system.

$$\omega_{x}^{\prime} = \omega_{x} + s$$

$$\omega_{y}^{\prime} = \omega_{y}$$

$$\omega_{z}^{\prime} = \omega_{z}$$
(2)

and Equation (1) becomes

$$H_{x} = I_{xx} (\omega_{x} + s)$$

$$H_{y} = I_{yy} \omega_{y}$$

$$H_{z} = I_{zz} \omega_{z} \qquad . \tag{3}$$

The general vector equation of motion is  $\underline{M} = \underline{\dot{H}}$ . Recalling that the rate of change of  $\underline{H}$  is

$$\underline{\dot{H}} = (\underline{\dot{H}})_{r} + \underline{\omega} \times \underline{\dot{H}}$$
 (4)

where  $(\dot{\underline{H}})_r$  is the rale of change of the absolute angular momentum as measured in the seeker gyro basis, i.e.,

$$(\underline{\dot{H}})_{r} = I_{xx} (\dot{\omega}_{x} + s)_{x} + (I_{yy} \dot{\omega}_{y})_{x} + (I_{zz} \dot{\omega}_{z})_{x}$$
(5)

From Figure 1,

$$\underline{\omega} = \dot{\theta} \sin \psi \, \underline{\mathbf{i}} + \dot{\theta} \cos \dot{\psi} \, \underline{\mathbf{j}} \, \dot{\psi} \, \underline{\mathbf{k}} \qquad . \tag{6}$$

Because of the gyro symmetry and actua. specification values, a special case is treated here, i.e.,

$$I = I_{xx} = I_{yy} = I_{zz}$$
 (7)

In Figure 1, s is a constant spin rate and s  $\gg \omega_v$  and  $\omega_z$ ; therefore,

$$\underline{\mathbf{H}} \doteq \mathbf{Isi} = \mathbf{h} \qquad . \tag{8}$$

For an ideal gyro, the rotor gimballed terms ( $\dot{\omega}_y$  and  $\dot{\omega}_z$ ) are small when compared to the  $\omega_y$ s and  $\omega_z$ s terms; also, no  $\dot{\omega}_x$  term is possible due to the physical system constraints. Therefore,  $(\dot{\underline{H}})_r$  can be neglected in comparison with  $\underline{\omega} \times \underline{H}$ .

Evaluating  $\underline{\omega} \times \underline{H}$  using the determinant form of the cross product gives

$$\underline{\omega} \times \underline{h} = \begin{vmatrix} \underline{i} & \underline{j} & \underline{k} \\ \dot{\theta} \sin \psi & \dot{\theta} \cos \psi & \dot{\psi} \end{vmatrix} . \tag{9}$$

$$I_{S} = \begin{bmatrix} 0 & 0 & 0 \end{bmatrix}$$

Then

$$M_{X} = 0$$

$$M_{Y} = Is \dot{\Psi}$$

$$M_{Z} = -Is \dot{\theta} \cos \Psi \qquad , \qquad (10)$$

where Is is angular momentum and is considered a constant gain value in the model.

# B. Dynamic (Realistic) 2-DOF Gimballed Gyroscope Model

Figure 2 shows the system in a configuration (with respect to body fixed reference  $X_I$ ,  $Y_I$ ,  $Z_I$ ) and orientation of the gyro system by using the seeker Euler angles  $\psi$  and then  $\theta$ . The system has 2-DOF (the speed n of the rotor with respect to gimbal G prescribed as constant). Angle  $\theta$  defines the angular position of the inner gimbal G with respect to the outer gimbal O. The angle  $\psi$  defines the angular position of the outer gimbal with respect to the vehicle I. Using the general vector equation of motion ( $\underline{M}$ ) = ( $\underline{H}$ ) and rewriting in matrix expressions gives

$$\{\mathbf{M}_0\} = \{\dot{\mathbf{H}}_{TS}\}_{\mathsf{T}} \tag{11}$$

$$\{H_{TS}\} = \{H_0\} + \{H_C\} + \{H_R\}$$
 (12)

but

$$\{H_0\} = [I_0] \{\omega_{0-1}\}$$
 (13)

$$\{H_{G}\} = [I_{G}] \{\omega_{G-T}\}$$

$$(14)$$

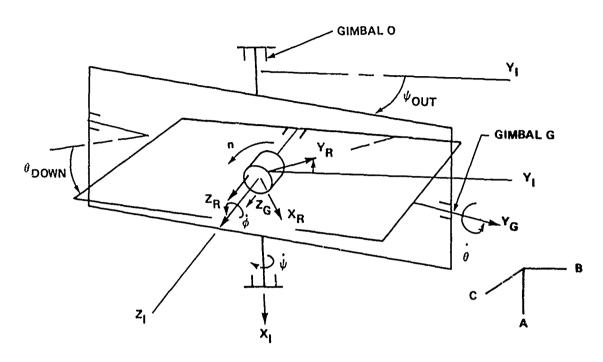


Figure 2. Dynamic seeker gyro coordinate system.

and

$$\{H_{R}\} = [I_{R}] \{\omega_{R-I}\} = [I_{R}] \{\omega_{R-G}\} + \{\omega_{G-I}\}$$
 (15)

but  $\{\omega_{R-G}\} \doteq \{\dot{\phi}\}$ . Therefore,

$$H_{R} = [I_{R}] \{\dot{\phi}\} + [I_{R}] \{\omega_{G-I}\}$$
 (16)

but [I\_R]  $\{\dot{\phi}\} \doteq \{h\}$ . Then

$$\{H_{R}\} = \{h\} + [I_{R}] \{\omega_{G-I}\}$$
 (17)

where

 $\{M_0\}$  = moment or torque (column matrix) about outer gimbal

 $\{\rm H^{}_{TS}\}$  = angular momentum of total system (column matrix) in vehicle frame

 $\{H_{O}\}$  = angular momentum (column matrix) of outer gimbal

 $\{H_G^{}\}\ = \ {\rm angular\ momentum\ (column\ matrix)}$  of inner gimbal

{h} = angular momentum (corumn matrix) of rotor

 $\{H_{R}^{}\}$  = total angular momentum (column matrix) of rotor

 $[1_0]$  = inertia tensor of cuter gimbal

 $[I_G]$  = inertia tensor of inner gimbal

 $[I_p]$  = inertia tensor of rotor

 $\{\omega_{O-T}^{}\}$  = angular velocity (column matrix) of outer wrt vehicle

 $\{\omega_{G-T}^{}\}$  = angular velocity (column matrix) of inner wrt vehicle

 $\{\omega_{R-T}^{}\}$  = angular velocity (column matrix) of rotor wrt vehicle .

$$\{\dot{\phi}\} = \left\{\begin{matrix} \dot{\phi} \\ \dot{\phi} \end{matrix}\right\}$$

Rearranging Equation (12) and taking derivatives of Equations (11) and (12) gives

$$\{M_{O}\} = \{\dot{H}_{TS}\}_{G} + [\omega_{G-I}] \{H_{TS}\} = \frac{d}{dt} \left[\{h\} + [I_{R}] \{\omega_{G-I}\} + [I_{G}] \{\omega_{G-I}\} + [I_{O}] \{\omega_{O-I}\}\right]_{G} + [\omega_{G-I}]$$

$$\left[\{h\} + [I_{R}] \{\omega_{G-I}\} + [I_{C}] \{\omega_{G-I}\} + [I_{O}] \{\omega_{O-I}\}\right]$$

$$(18)$$

where

$$[\omega_{G-I}] = \begin{bmatrix} 0 & -\omega_z & \omega_y \\ \omega_z & 0 & -\omega_x \\ -\omega_y & \omega_z & 0 \end{bmatrix}$$

Therefore,

$$\begin{aligned} \{\dot{\mathbf{H}}_{\mathrm{TS}}\}_{\mathrm{I}} &= \{\dot{\mathbf{h}}\}_{\mathrm{G}} + [\dot{\mathbf{I}}_{\mathrm{R}}]_{\mathrm{G}} \{\omega_{\mathrm{G-I}}\} + [\dot{\mathbf{I}}_{\mathrm{R}}]_{\mathrm{G}} \{\dot{\omega}_{\mathrm{G-I}}\}_{\mathrm{G}} + [\dot{\mathbf{I}}_{\mathrm{G}}]_{\mathrm{G}} \{\omega_{\mathrm{G-I}}\} \\ &+ [\mathbf{I}_{\mathrm{G}}] \{\dot{\omega}_{\mathrm{G-I}}\}_{\mathrm{G}} + [\dot{\mathbf{I}}_{\mathrm{O}}]_{\mathrm{O}} \{\omega_{\mathrm{O-I}}\} + [\mathbf{I}_{\mathrm{O}}] \{\dot{\omega}_{\mathrm{O-I}}\}_{\mathrm{O}} \\ &+ [\omega_{\mathrm{G-I}}] \{\dot{\mathbf{h}}\} + [\omega_{\mathrm{G-I}}] ([\mathbf{I}_{\mathrm{R}}] + [\mathbf{I}_{\mathrm{G}}]) \{\omega_{\mathrm{G-I}}\} \\ &+ [\omega_{\mathrm{G-I}}] [\mathbf{I}_{\mathrm{O}}] \{\omega_{\mathrm{O-T}}\} . , \end{aligned}$$

$$(19)$$

Collecting terms gives

$$\{M_{O}\} = \{\dot{H}_{TS}\}_{I} = \{\dot{h}\}_{G} + ([I_{R}] + [I_{G}]) \{\dot{\omega}_{G-I}\}_{G} + [I_{O}] \{\dot{\omega}_{O-I}\}_{O} + [\omega_{G-I}] \{h\} + [\omega_{G-I}] ([I_{R}] + [I_{G}]) \{\omega_{G-I}\}$$

$$(20)$$

Consider that for a constant speed motor

$$\left\{\dot{\mathbf{h}}\right\}_{\mathbf{C}} = 0, \tag{21}$$

and neglecting the second order terms,

$$[\omega_{G-1}]$$
  $([I_R] + [I_G])$   $\{\omega_{G-1}\}$ 

then,

$$\{M_{O}\} = ([I_{R}] + [I_{G}]) \{\dot{\omega}_{G-I}\}_{G} + [I_{O}] \{\dot{\omega}_{G-I}\}_{O} + [\omega_{G-I}] \{h\} . \quad (22)$$

Thus, Equation (22) is the simplified moment equation, but the moment equation for a complete gyro is Equation (20).

Coordinating the equation to get scalar components in the inner gimbal frame G, then

$$\{h\} = [I_R] \{\omega_{R-G}\}$$
 (23)

Therefore,

$$\{\dot{\mathbf{h}}\}_{G} = \frac{\mathrm{d}}{\mathrm{d}t} \left( [\mathbf{I}_{R}] \{\omega_{R-G}\} \right)_{G} = [\dot{\mathbf{I}}_{R}]_{G} \{\omega_{R-I}\} + [\mathbf{I}_{R}] \{\omega_{R-G}\}_{G}$$
 (24)

Then

$$\{\dot{h}\}_{G} = [I_{R}] \{\dot{\phi}\}$$
 (25)

 $\{\dot{\mathbf{h}}\}_{G}$  would be zero if spin rotor rotated at a constant speed as with a hysterisis motor. In some application, "h-modulation" may be desirable, so retain the term  $\{\dot{\mathbf{h}}\}_{G}$ , i.e.,  $\{\dot{\mathbf{h}}\}_{G}\neq 0$ 

Using the matrix properties of the inertia tensor to find an orientation of a given rigid body so that all products of inertia are zero simultaneously, i.e., the inertia matrix is diagonal. Substituting A, B, C for  $I_{xx}$ ,  $I_{yy}$ ,  $I_{zz}$ , respectively, then Equation (25) becomes

$$\{\dot{\mathbf{h}}\}_{\mathbf{G}} = [\mathbf{I}]_{\mathbf{R}} \{\dot{\phi}\}_{\mathbf{G}} = \begin{bmatrix} \Lambda_{\mathbf{R}} & \mathbf{0} & \mathbf{0} \\ \mathbf{0} & \mathbf{B}_{\mathbf{R}} & \mathbf{0} \\ \mathbf{0} & \mathbf{0} & \mathbf{C}_{\mathbf{R}} \end{bmatrix} \begin{bmatrix} \mathbf{0} \\ \mathbf{0} \\ \ddot{\phi} \end{bmatrix} = \begin{bmatrix} \mathbf{0} \\ \mathbf{0} \\ \mathbf{C}_{\mathbf{p}} \ddot{\phi} \end{bmatrix}$$
(26)

$$\left( \begin{bmatrix} I_R \end{bmatrix}_G + \begin{bmatrix} I_G \end{bmatrix}_G \right) = \begin{bmatrix} A_R + A_G & 0 & 0 \\ 0 & B_R + B_G & 0 \\ 0 & 0 & C_R + C_G \end{bmatrix} .$$
 (27)

Knowing

$$\{\omega_{G-I}\}_{G} = \{\omega_{G-O}\}_{G} + T_{OG} \{\omega_{O-I}\}_{O} ;$$
 (28)

then

$$\{\omega_{G-O}\}_{G} = \begin{bmatrix} 0 \\ \dot{\theta} \\ 0 \end{bmatrix}; \quad \{\omega_{O-I}\}_{O} = \begin{bmatrix} \dot{\phi} \\ 0 \\ 0 \end{bmatrix}$$
 (29)

and

$$T_{\text{OG}} = \begin{bmatrix} c\theta & 0 & -s\theta \\ 0 & 1 & 0 \\ s\theta & 0 & c\theta \end{bmatrix}$$

$$(30)$$

where  $c\theta = \cos \theta$ ,  $s\theta = \sin \theta$ . Therefore,

$$\{\omega_{G-I}\}_{G} = \begin{bmatrix} 0\\ \dot{\theta}\\ 0 \end{bmatrix} + \begin{bmatrix} c\theta & 0 & -s\theta\\ 0 & 1 & 0\\ s\theta & 0 & c\theta \end{bmatrix} \begin{bmatrix} \dot{\psi}\\ 0\\ 0 \end{bmatrix} = \begin{bmatrix} \dot{\psi}c\theta\\ \dot{\theta}\\ \dot{\psi}s\theta \end{bmatrix}$$
 (31)

Thus

$$\{\dot{\omega}_{G-1}\}_{G} = \begin{bmatrix} \ddot{\psi}_{C\theta} - \dot{\psi} & s\theta & \dot{\theta} \\ \vdots & \vdots & \vdots \\ \ddot{\theta} & \vdots & \vdots \\ \dot{\psi}_{S\theta} + \dot{\psi} & c\theta & \dot{\theta} \end{bmatrix}$$
(32)

and

$$[I_{0}] \{\dot{\omega}_{0-1}\}_{0} = \{\dot{H}_{0}\} = [I_{0}] \{\dot{\omega}_{0-1}\}_{0} = \begin{bmatrix} A_{0} & \tilde{\Psi} \\ 0 \\ 0 \end{bmatrix} . \tag{33}$$

Therefore, the derivative of  ${\rm H}_{\rm O}$  in I frame coordinatized in the G frame is

and

$$\begin{bmatrix} \omega_{G-I} \end{bmatrix}_{G} \begin{cases} h \rbrace_{G} = \begin{bmatrix} \dot{\theta}h \\ -h \dot{\psi} c\theta \end{bmatrix}$$
(35)

where

$$\begin{bmatrix} \omega_{G-I} \end{bmatrix}_{G} = \begin{bmatrix} 0 & -\dot{\psi}s\theta & \theta \\ \dot{\psi}s\theta & 0 & -\dot{\psi}c\theta \\ -\dot{\theta} & \dot{\psi}c\theta & 0 \end{bmatrix}$$

and

$$\begin{bmatrix} \omega_{G-I} \end{bmatrix} \begin{bmatrix} I_R \end{bmatrix} + \begin{bmatrix} I_G \end{bmatrix} \{ \omega_{G-I} \} = \begin{bmatrix} (C' - B') & \dot{\theta} \psi s \theta \\ (A' - C') & \dot{\psi}^2 c \theta s \theta \\ (B' - A') & \dot{\theta} \dot{\psi} c \theta \end{bmatrix}$$
(36)

where

$$A' = A_R + A_G$$

$$B' = B_R + B_G$$

$$C' = C_R + C_G$$

$$\{M_{O}\}_{G} = \begin{bmatrix} M_{OXG} \\ M_{OYG} \\ M_{OZG} \end{bmatrix}$$
 (37)

Collect all terms in Equations (26) through (37) to get matrix formulation:

$$\begin{bmatrix} M_{\text{OXG}} \\ M_{\text{OYG}} \\ M_{\text{OZG}} \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ C_{\text{R}} \ddot{\phi} \end{bmatrix} + \begin{bmatrix} A' & 0 & 0 \\ 0 & B' & 0 \\ 0 & 0 & C' \end{bmatrix} \begin{bmatrix} \ddot{\psi}_{\text{C}}\theta - \dot{\psi}_{\text{S}}\theta\dot{\theta} \\ \ddot{\theta} \\ \ddot{\psi}_{\text{S}}\theta + \dot{\theta}_{\text{C}}\theta\dot{\theta} \end{bmatrix} + \begin{bmatrix} A_{\text{O}}\ddot{\psi}_{\text{C}}\theta \\ 0 \\ 0 \\ A_{\text{O}}\ddot{\psi}_{\text{S}}\theta \end{bmatrix}$$

$$+\begin{bmatrix} \dot{\theta}h \\ -h\dot{\psi}c\theta \\ 0 \end{bmatrix} + \begin{bmatrix} (C' - B') \dot{\theta}\dot{\psi}s\theta \\ (A' - C') \dot{\psi}^2c\theta s\theta \\ (B' - A') \dot{\theta}\dot{\psi}c\theta \end{bmatrix} . \tag{38}$$

Add all matrices as indicated and break out individual components as follows to get complete nonlinear equations with no restraints on motor:

$$M_{OXG} = (A_{R} + A_{G} + A_{O}) \ddot{\psi}c\theta$$

$$+ (-A_{R} - A_{G} - B_{R} - B_{G} + C_{R} + C_{G}) \dot{\theta}\dot{\psi}s\theta + h\dot{\theta}$$

$$M_{OYG} = (B_{R} + B_{G}) \ddot{\theta} + (A_{R} + A_{G} - C_{R} - C_{G}) \dot{\psi}^{2}c\theta s\theta - h\dot{\psi}c\theta$$

$$M_{OXG} = C_{R} \ddot{\phi} + (C_{R} + C_{G} + B_{R} + B_{G} - A_{R} - A_{G}) \dot{\theta}\dot{\psi}c\theta$$

$$+ (C_{R} + C_{G} + A_{O}) \ddot{\psi}s\theta$$
(39)

where

$$M_{OXG} = M_{\psi} c\psi - r\dot{\psi}$$

$$M_{OYG} = M_{\theta} c\theta - b\dot{\theta}$$

$$M_{OZG} = 0$$
(40)

and

 $r\dot{\psi} \stackrel{\Delta}{=}$  gimbal bearing friction between the outer gimbal and base  $b\dot{\vartheta} \stackrel{\Delta}{=}$  bearing friction between outer and inner gimbal .

For a general linear solution of Equation (39), linearize about an equilibrium position by letting:

$$\theta = \theta + \delta\theta$$

$$\dot{\theta} = \dot{\theta} + \delta\dot{\theta}$$

$$\psi = \psi + \delta\psi$$

$$\dot{\psi} = \dot{\psi} + \delta\dot{\psi} \Rightarrow \text{etc.}$$

Substitute into the nonlinear Equation (39); i.e., about  $\theta = 0$  for small  $\theta$  about equilibrium, e.g.,

$$c\theta = c(\theta + \delta\theta) = c\theta c\delta\theta - s\theta s\delta\theta = 1$$

$$s\theta = s(\theta + \delta\theta) = s\theta c\delta\theta + c\theta s\delta\theta = \delta\theta$$
 (41)

Using the first of Equation (39) and substituting the preceding gives

$$M_{OXG}$$
 (linearized) =  $A\ddot{\psi} + A'\dot{\theta}\dot{\psi}\delta\theta + h\dot{\theta}$  (42)

where

$$A = A_{R} + A_{G} + A_{O}$$

$$B = -A_{R} - A_{G} - B_{R} - B_{G} + C_{R} + C_{G}$$

$$M_{OXG} + \delta M_{OXG} = A\ddot{\psi} + A\delta\ddot{\psi} + B(\dot{\theta} + \delta\dot{\theta})(\dot{\psi} + \delta\dot{\psi})\delta\psi + h\dot{\theta} + h\delta\dot{\theta} . \tag{43}$$

Subtracting Equation (42) from Equation (43) gives

$$\delta M_{OXG} = A\delta \ddot{\psi} + B\dot{\theta} \delta \dot{\psi} \delta \theta + B\delta \dot{\theta} \dot{\psi} \delta \theta + B\delta \dot{\theta} \delta \dot{\psi} \delta \theta + h\delta \dot{\theta} \qquad (44)$$

All small second terms can be removed in Equation (45), therefore,

$$\delta M_{OXG} = A\delta \ddot{\psi} + h\delta \dot{\theta} \qquad (45)$$

A similar method can be applied to the  ${\rm M}_{\mbox{OYG}}$  equation in Equation (39) to give

$$\delta M_{OYG} = B\delta \ddot{\theta} - ho\dot{\psi} \qquad , \tag{46}$$

dropping the %1 terms for small angle approximation to get

$$M_{OXG} = A\ddot{\psi} + h\dot{\theta}$$

$$M_{OYG} = B\ddot{\theta} - h\dot{\psi} \qquad . \tag{47}$$

Substituting values from Equation (40) for  $^{M}_{
m OXG}$  and  $^{M}_{
m OYG}$  with small angle approximation into Equation (47) to get

$$A\ddot{\psi} + r\dot{\psi} + h\dot{\theta} = M_{\psi}$$

$$B\ddot{\theta} + b\dot{\theta} - h\dot{\psi} = M_{\theta}$$
(48)

#### IV. SYSTEM SIMULATION

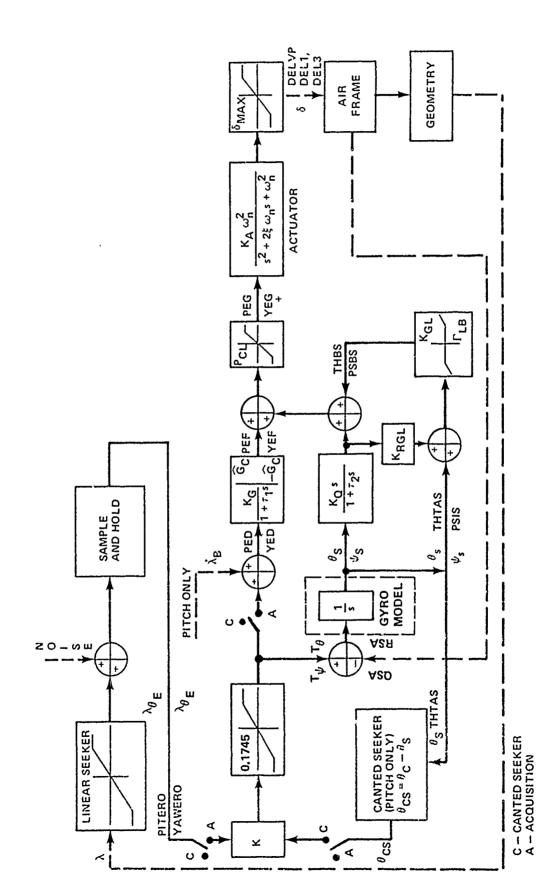
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The guidance and control system block diagram pitch/yaw channels for the 6-DOF digital simulation is presented in Figure 3. Figure 3 shows how the signal generated by the seeker is used to drive the vanes. The seeker signal is routed to the gyroscope and damping network before going to the guidance filter. It also goes directly to the guidance filter. The output from the guidance filter is then sent to the actuator which in turn drives the vanes. The only change between evaluation of the two types of gyro models would be in the torque gain terms and the block marked "Gyro Model" as shown in Figure 3. The 6-DOF computer program listings are given in Appendices A and C. A Continuous System Simulation Language (CSSL) program is given in Appendix B. The CSSL program was utilized to analyze only the motion of the dynamic gyro prior to implementation in the 6-DOF simulation.

In this section, the CSSL program results are given for the dynamic gyro model. The 6-DOF digital missile trajectory results are given for both the idealized and the dynamic gyro models. In addition, comparison analyses of the two trajectory simulation results are made.

A. 6-DOF Digital Simulation with Ideal 2-DOF Gimballed Gyro Model

A detailed block diagram of the ideal gyro model is shown in Figure 4; of the dynamic gyro model in Figure 5. The gyro system equations of motion are presented for pitch/yaw channels as follows:



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Guidance and control system block diagram pitch/yaw channels. Figure 3.

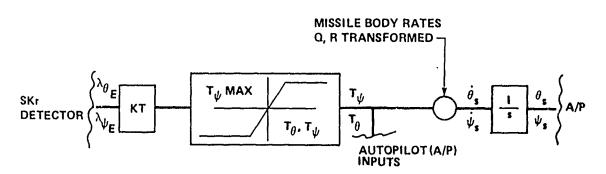


Figure 4. Ideal gyro model.

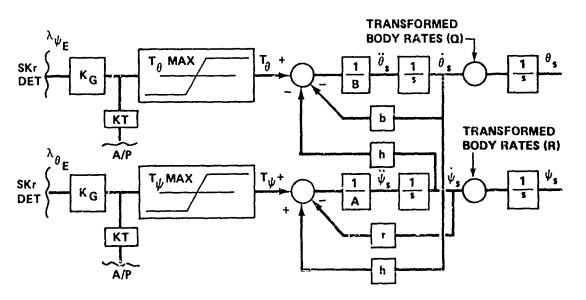


Figure 5. Gyro model in the 6-DOF simulation.

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$$T_{\psi} = \dot{\theta}_{s} \cos \psi_{s} + QSA$$

$$T_{\theta} = \dot{\psi}_{s} + RSA \tag{49}$$

where QSA and RSA are transformed of missile body rates, Q, R; respectively, and  $\dot{\theta}_s \cos \psi_s$  and  $\dot{\psi}_s$  are M<sub>Z</sub> and M<sub>y</sub>, respectively, as taken from Equation (9). Table 1 gives the units, symbols, and names of the missile parameters used for all plots with respect to the time presented in this report. The 6-DOF digital trajectory simulation program and tabulated results are presented in Appendix A. Plots of

the missile parameters are given in Figures 6 through 55. Figures 6 through 14 represent the results of the missile (translational and angular velocities) and body Euler angles. Figures 15 through 20 show the missile position and missile to target displacements. Figures 21 through 35 represent the autopilot and actuator parameters during flight. Figures 36 through 39 show the seeker input-output values in flight. Gyro parameters are given in Figures 40 through 55. Results indicated that when an ideal gyro is utilized, the missile to target RSS accuracy is 0.215 ft at impact for a 4-km (13,120-ft) target in 14.922 sec. X, Y, Z missile error components at impact are 0, -0.0183, and -0.2, respectively. The signs on the error components mean the missile hit to the left and above the target.

#### B. Dynamic (Realistic) 2-DOF Gimballed Gyro

In order to obtain a more realistic assessment of a 2-DOF gimballed gyro performance, efforts were made to model the dynamics of the gyro more accurately. The equations of this model are given in Section III.B.

When considering Equation (48) for the 6-DOF digital simulation, the signs on the precession rates (h0, h $\dot{\psi}$ ) will change because of different coordinate systems, i.e., a positive  $T_{\dot{\psi}}$  will give a negative h0 precession rate and positive  $T_{\dot{\theta}}$  will give a positive h $\dot{\psi}$  precession rate.

Thus,

$$A\dot{\psi} + r\dot{\psi} - h\dot{\theta} = T_{\psi}$$

$$B\ddot{\theta} + b\dot{\theta} + h^{i} = T_{\theta}$$

where

100

A and B = moments of inertia

r, b = gimbal bearing friction

h = angular momentum

 $T_b$ ,  $T_\theta$  = moments or torques

The preceding typical parameter values of this gyro, which has to exhibit a 10-deg/sec tracking rate and 160-Hz nutation frequency, is given in Table 2.

TABLE 1. PROGRAM VARIABLES AND DEFINITIONS

Time	Time of missile trajectory (sec)
U U	Missile velocity in body coordinate system (BCS) (X-comp) (ft/sec)
v	Missile velocity in BCS (Y-comp) (ft/sec)
W	Missile velocity in BCS (Z-comp) (ft/sec)
P	Angular velocity of missile (about X-axis, roll rate) (rad/sec)
Q	Angular velocity of missile (about Y-axis, pitch rate) (rad/sec)
R	Angular velocity of missile (about Z-axis, yaw rate) (rad/sec)
РНІ ф	Euler angle transforming earth coordinate system (ECS) to BCS (rad)
тнта в	Euler angle transforming ECS to BCS (rad)
PSI ψ	Euler angle transforming ECS to BCS (rad)
x	Position of missile in ECS (X-component) (ft)
Y	Position of missile in ECS (Y-component) (ft)
Z	Position of missile in ECS (Z-component) (ft)
DELXS	Missile to target displacement in seeker coordinate system (SCS) (X-direction) (ft)
DELYS	Missile to target displacement in SCS (Y-direction) (ft)
DELZS	Missile to target displacement in SCS (Z-direction) (ft)
THRBS	Output of the differentiator (rate damping) of pitch autopilot (A/P) (rad)
PSRBS	Output of the differentiator (rate damping) of yaw A/P (rad)
THBS	Output of the dead band zone limiter pitch A/P (rad)
PSBS	Output of the dead band zone limiter pitch A/P (rad)
PED	Input to guidance filter (pitch plane) (rad/sec)
YED	Input to guidance filter (yaw plane) (rad/sec)
PEF	Output of guidance filter (pitch plane) (rad/sec)
YEF	Output of guidance filter (yaw plane) (rad/sec)

TABLE 1. (CONCLUDED)

PEG		Output of pitch A/P (rad)
YEG		Output of yaw A/P (rad)
PHIG		Input to shaping filter of roll A/P
REG		Output of roll A/P (rad)
DELVP		Equivalent vane deflection (pitch plane) (rad)
DEL1		Deflection of Vane 1 (rad)
DEL3		Deflection of Vane 3 (rad)
PITERR		Seeker input - LOS error in pitch plane (rad)
PITERO		Seeker output - LOS error in pitch plane (rad)
YAWERR		Seeker input - LOS error in yaw plane (rad)
YAVERO		Seeker output - LOS error (rad)
DTHTAS	ė s	Time derivative of THTAS (rad/sec)
THTAS	θs	THETA angle of gyro seeker (rad) - pitch angle between the body and seeker axis
DPSIS	· Ψs	Time derivative of PSIS (rad/sec)
PSIS	ψ s	PSI angle of gyro seeker (rad) - yaw angle between the body and seeker axis
OMEGZ		Gyro torque input from seeker (rad/sec)
OMEGY		Gyro torque input from seeker (rad/sec)
QSA		Transformation of P, Q, R into the SCS for gyro (pitch plane)
RSA		Transformation of $P$ , $Q$ , $R$ into the SCS for gyro (yaw plane)
DTHASD	<sup>ij</sup> s	Time derivative of THASD [(rad/sec)/sec]
THASD	ė s	State variable - time derivative of THAT3 (rad/sec)
DPSISD	Ψ̈́s	Time derivative of PSISD [(rad/sec)/sec]
PS1SD	$\dot{\psi}_{\mathbf{s}}$	State variable time derivation of PSIS (rad/sec)

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#### 1. CSSL Program

The gyro model with parameters (Table 2) was incorporated into the CSSL simulation. The results, presented in Figure 56 with use of the typical CSSL program listing given in Appendix B, indicated the gyro behaved as expected with step inputs, that is, it exhibited the 10-deg/sec tracking rate and the 160-Hz nutation frequency. At this point, the gyro model was incorporated into the 6-DOF digital missile trajectory simulation. Section IV.B.2 gives the results of implementing the dynamic gyro model in the 6-DOF simulation.

# 6-DOF Digital Simulation with Dynamic 2-DOF Gimballed Gyro Model

The idealized gyro model was replaced by the dynamic gyro model and successfully implemented in the 6-DOF simulation. A detailed block diagram of the dynamic gyro model is described in Figure 5 and the second order differential equations of motions for the gyro are shown for the pitch/yaw channels.

$$A\ddot{\psi}_{s} + r\dot{\psi}_{s} - h\dot{\theta}_{s} = T_{\psi}$$

$$B\ddot{\theta}_{s} + b\dot{\theta}_{s} + h\dot{\psi}_{s} = T_{\theta}$$

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The 6-DOF digital trajectory simulation program and tabulated results are shown in Appendix B. Again plots of the missile parameters are presented in Figures 57 through 120. Figures 57 through 65 give the results of the missile translational and angular velocities and body Euler angles in flight. Plots of the missile position and target displacements are shown in Figures 66 through 73. Figures 74 through 88 give autopilots and actuator parameters plots. Plots of seeker input-output values are shown in Figures 89 through 92. Gyro parameters are given in Figures 93 through 120. The missile to target RSS accuracy is 1.68 ft at impact for the 4-km target in 14.936 sec. X, Y, Z missile error components at impact are 2.00, -0.154, and 0.1, respectively. The signs on the error components mean the missile hit in front, to the left, and above the target.

TABLE 2. DYNAMIC SEEKER - GYRO SPECIFICATIONS

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			Simulati	Simulation Units
Description	Notation	Eng. Units	CSSL	6-DOF
Pitch Inertia	В	0.462 lb in. <sup>2</sup>	0.0032083 1b-ft <sup>2</sup>	0.00009972 slug fr
Yaw Inertia	A	0.390 lb in. <sup>2</sup>	0.0027083 lb-ft <sup>2</sup>	0.00008414 slug fr <sup>2</sup>
Spin Momentum	h, H	17.7 in. oz-sec	0.0921875 ft 1b-sec	0.0921875 ft lb-sec
Gimbal Axis Friction l per axis	r,b	0.033 oz-in.	0.00017192 lb-ft	0.00017192 lb-ft
Moments or Torques	$ au_{\psi}$ , $ au_{ heta}$	3.0 inoz 3.18 inoz*	0.015625 ft-1b	0.016562 ft1b

\*An updated gyro specification.

#### C. Comparative Analyses

When considering the dynamic gyro model without the damping terms (r $\dot{\psi}$ , b $\dot{\theta}$ ), the gyro equations of motion become

$$B\ddot{\theta} + h\dot{\psi} = T_{\theta}$$

$$-h\dot{\theta} + A\ddot{\psi} = T_{th} \qquad . \tag{50}$$

The Laplace transform is used for the equation of motion:

$$\begin{bmatrix} s^{2} + \frac{h}{B} s \\ -\frac{h}{A} s + s^{2} \end{bmatrix} \begin{bmatrix} \Theta \\ \Psi \end{bmatrix} = \begin{bmatrix} \frac{T_{\theta}(s)}{B} + s\theta(0^{+}) + \dot{\theta}(0^{+}) + \frac{h_{\psi}}{B}(0^{+}) \\ \frac{T_{\psi}(s)}{A} - \frac{h}{A}\theta(0^{+}) + s\psi(0^{+}) + \dot{\psi}(0^{+}) \end{bmatrix} . (51)$$

Therefore, the characteristic equation is given from the left-hand side of the preceding equation by

$$s^2 \left( s^2 + \frac{h^2}{AB} \right) = 0 \tag{52}$$

the roots of which are s = 0, 0 and s =  $\pm jh \sqrt{AB}$ . The zero roots give "constant" motion. The imaginary roots give an oscillation at frequency  $\omega = h/\sqrt{AB}$ . To obtain a magnitude of  $\omega$ , the gimbals are massless and B, A are diametral moments of inertia of the rotor. They are equal to one-half its polar moment of inertia, B = A =  $I_{r/2}$ . Since h =  $I_r$ n where n = rotor speed, then

$$\omega = \frac{I_r n}{\sqrt{\frac{I_r^2}{4}}} = 2n \qquad . \tag{53}$$

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Therefore, the oscillation frequency is twice the spin speed. However, because real gimbals are not massless, the real gyro has an oscillation frequency somewhat less than 2n as is true in the dynamic gyro model. From the preceding characteristic equation, the oscillatory motion is undamped. Therefore, the rate-dependent terms  $(h\theta,\,h\dot\psi)$  act only as the gyroscopic coupling terms and do not produce energy dissipation for damping. Therefore, all damping occurs from the  $r\dot\psi$  and  $b\dot\theta$  terms.

Figures 93 through 100 and Figures 105 through 112 demonstrate the oscillatory frequency with damping and precession of the dynamic gyro. Figures 96 and 108 exhibit the 160-Hz nutation frequency of the gyro and 10-deg/sec tracking rate. The ideal gyro model reflects only the 1/s characteristics as seen in Figures 40 through 49.

The velocity and rotational components (V, W, Q, and R) of a missile in flight with the dynamic gyro model (given in Figures 58, 59, 61, and 62) show a definite increase and oscillatory effect with damping in the velocity components as compared to the ideal gyro. The body Euler angles 0 and  $\psi$  reflect this motion. The autopilot parameters also show the influence of the dynamic gyro response. Actuator output to the vanes (DELVP, DEL1, and DEL3) also reflect the differences between the ideal and dynamic gyro models.

Impact accuracy of the missile to target when utilizing an ideal gyro model or a dynamic gyro model in a 6-DOF digital simulation is shown in Table 3.

TABLE 3. IMPACT ACCURACY

	Time	X	Y Error	Z	RSS Miss Distance
Ideal Gyro	14.922	13120	-0.01832	-4000.2	0.2146
Dynamic Gyro	14.936	13118	-0.15455	-4000.1	1.6799

NOTES: X indicates range of target at 13,120 (4 km).

Y indicates crossrange error (minus left of target).

Z indicates vertical error (launched at -4000 ft above

sea level.

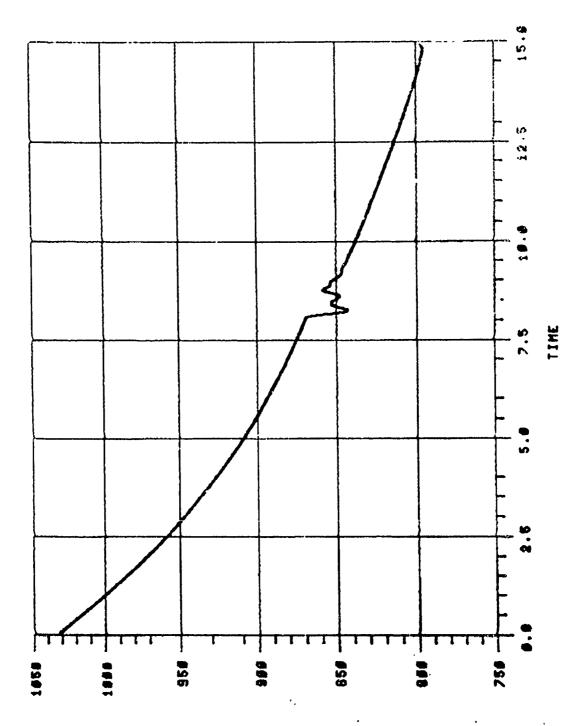
As can be seen in Table 3, the dynamic model will produce a better assessment of the missile accuracy at impact because a more realistic gyro model is used in the simulation.

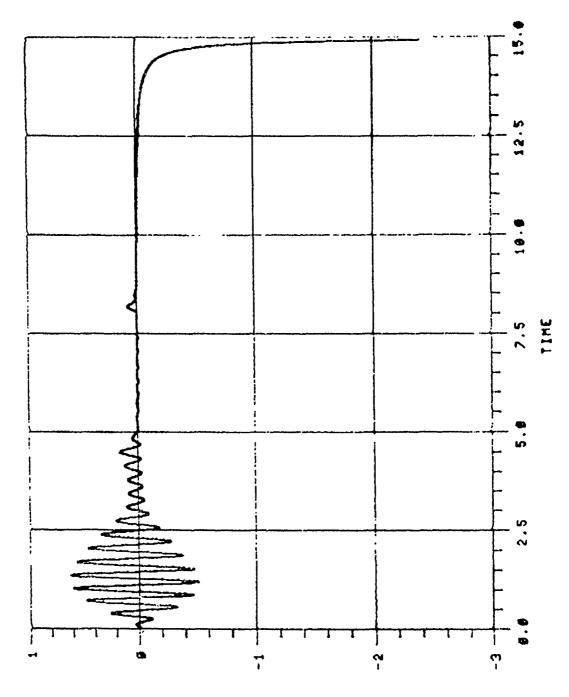
The primary 6-DOF programming difference between the ideal and dynamic gyro models as seen in Appendices A and C, respectively, is in the subroutine EDSKRGYRO. This subroutine reflects the change in gyro models.

#### V. CONCLUSION

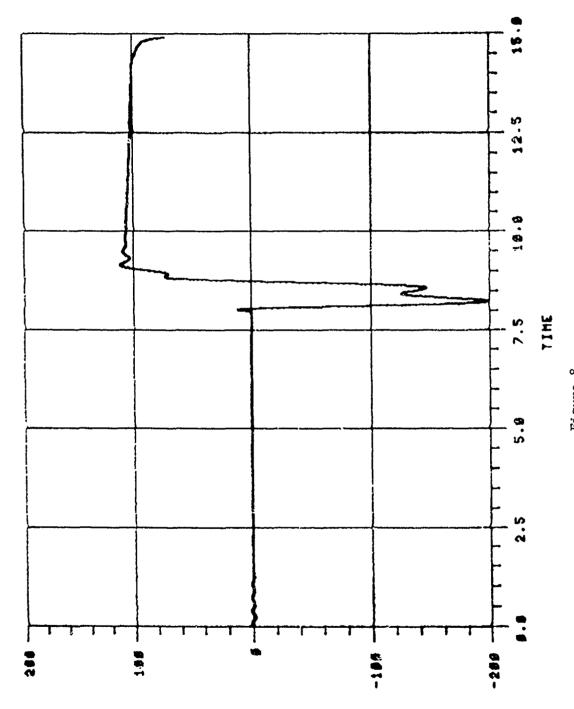
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This report has demonstrated that a dynamic gyro model, when utilized in a 6-DOF digital missile trajectory simulation, will give a more realistic assessment of a seeker gyro than an ideal gyro model. Most 6-DOF digital simulations in the past have used primarily the 2-DOF ideal gyro model. No efforts were made to change the autopilot or seeker characteristic in this study to accommodate the dynamic model. Reasonable results were obtained without change. However, considerations should be given to the use of the 2-DOF dynamic model based on results of this report. More accurate autopilot design and seeker interface design would probably result in the use of the dynamic gyro model for digital simulations.

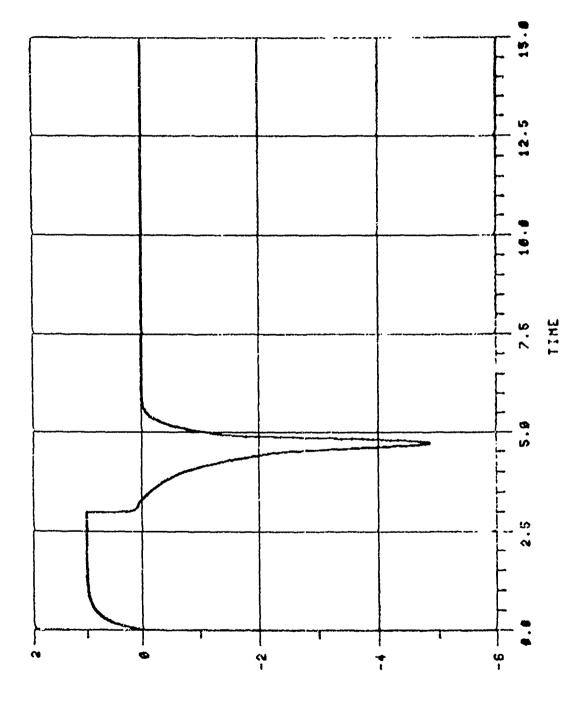




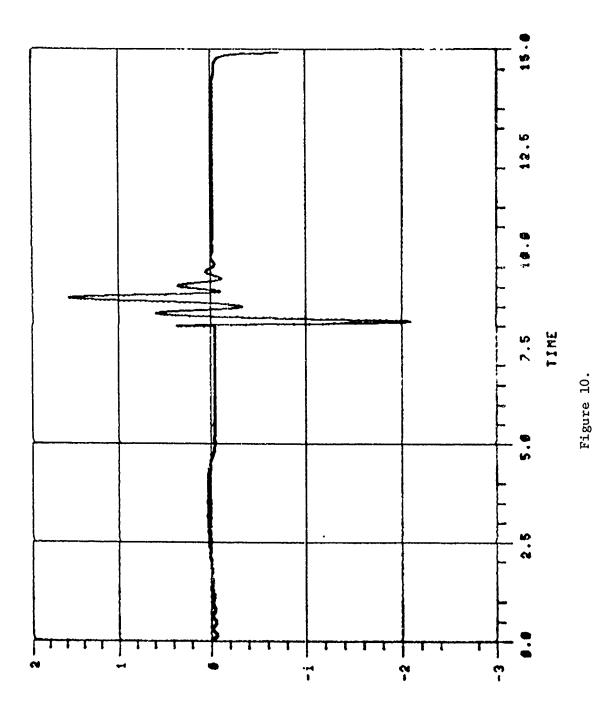
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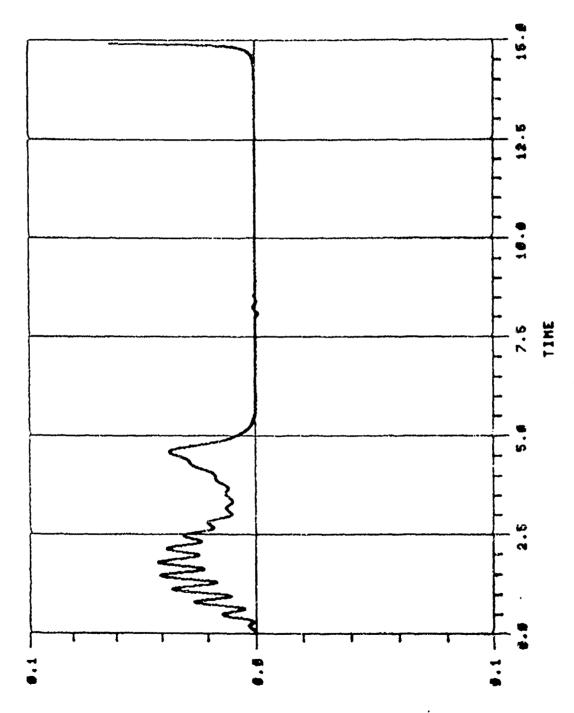






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Figure 11.

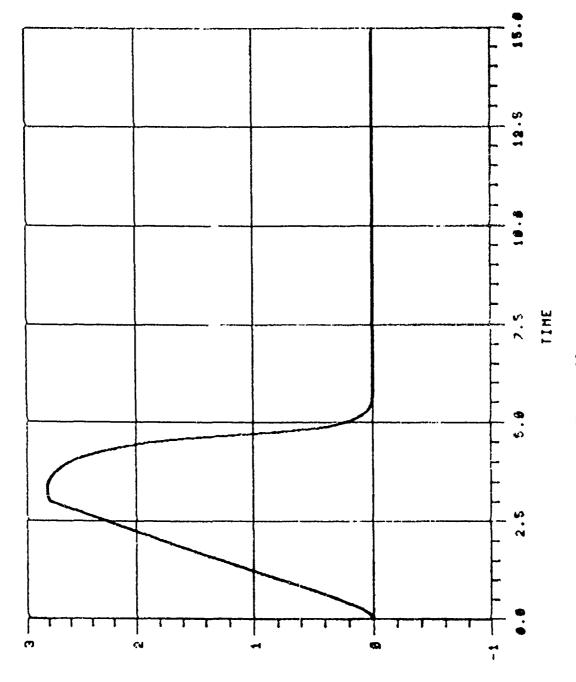
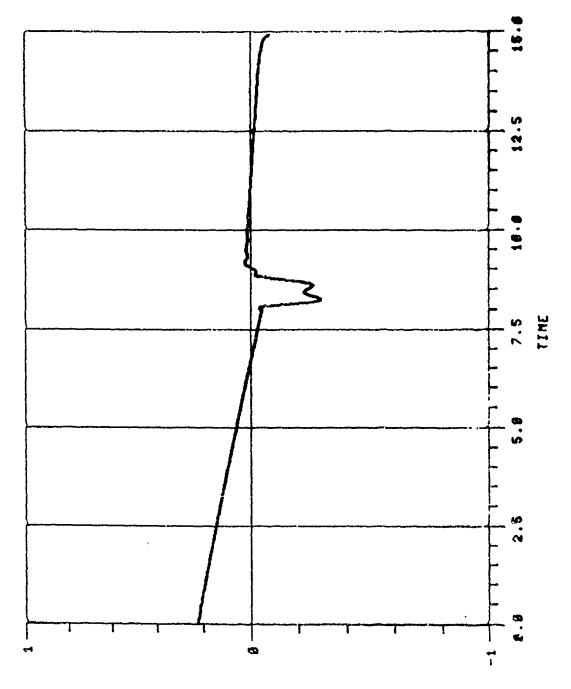


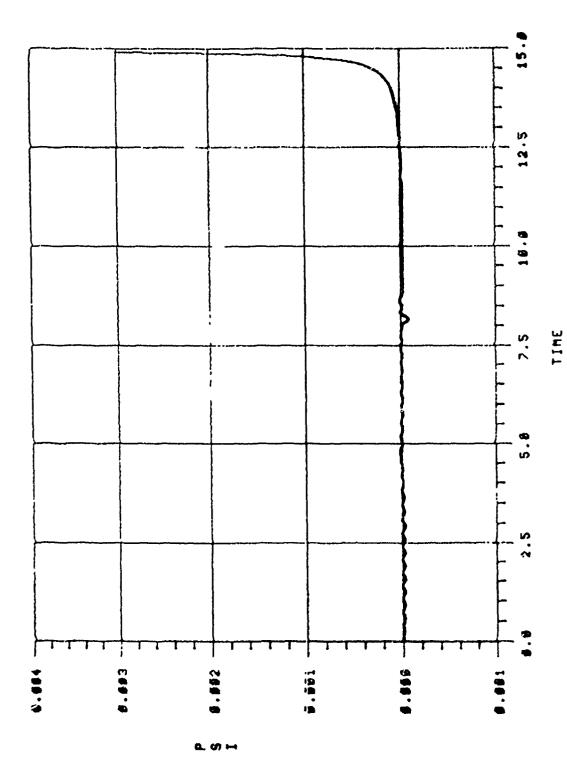
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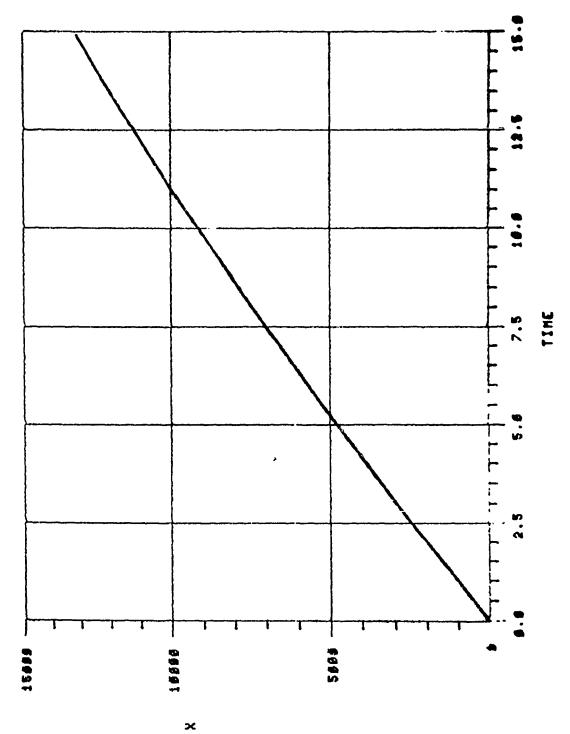
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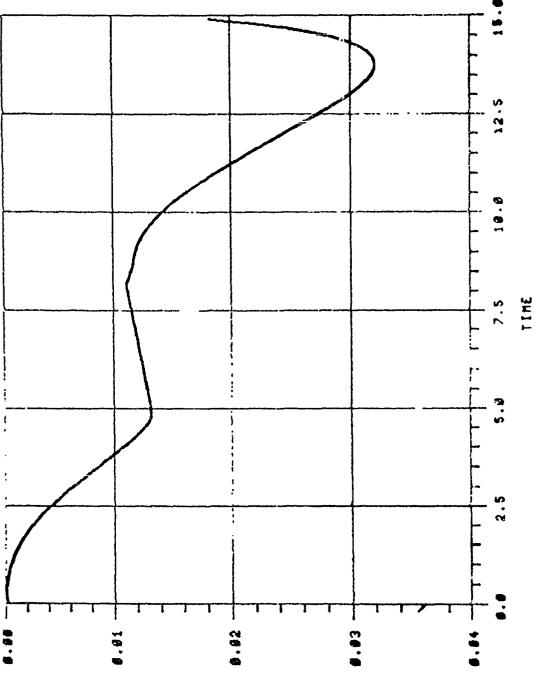
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Figure 15.



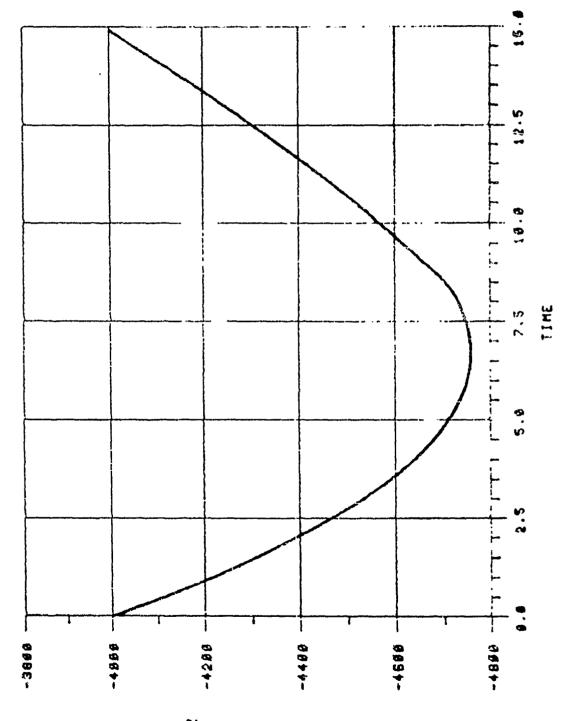
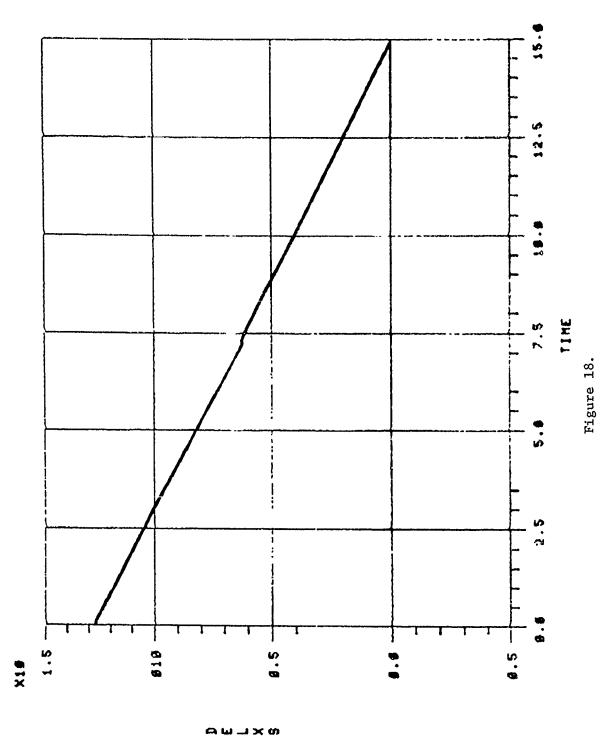
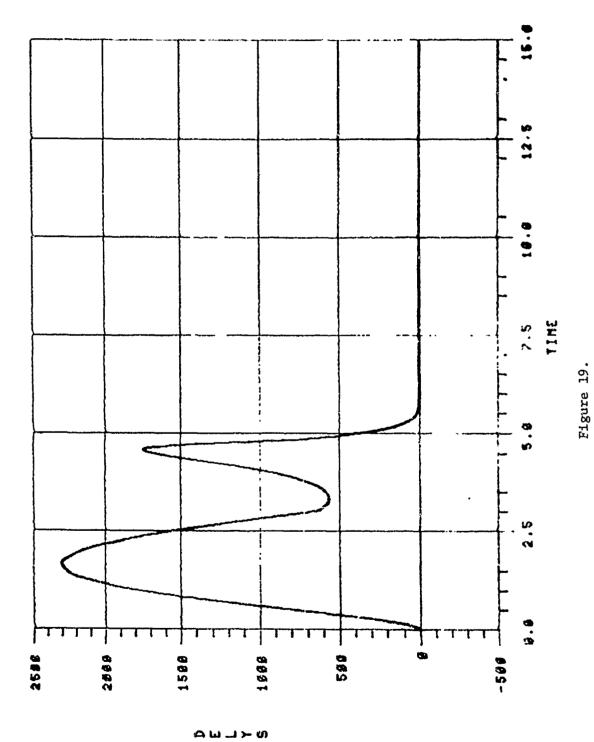
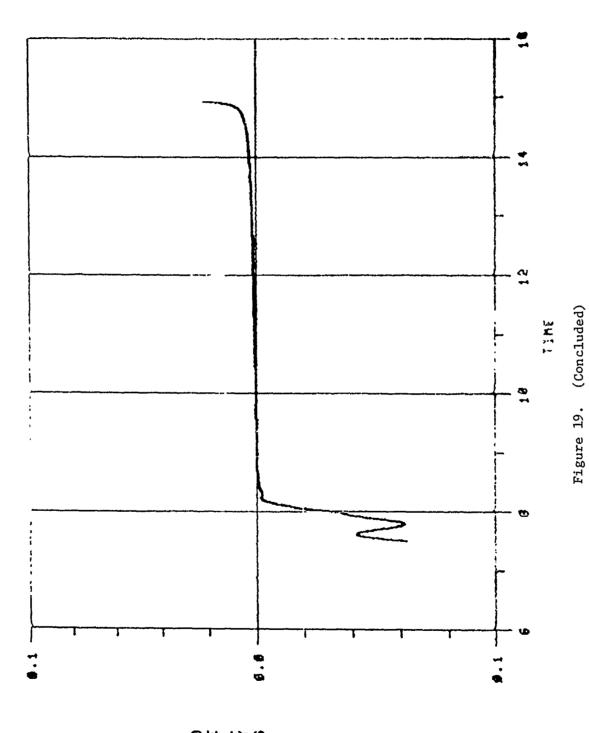


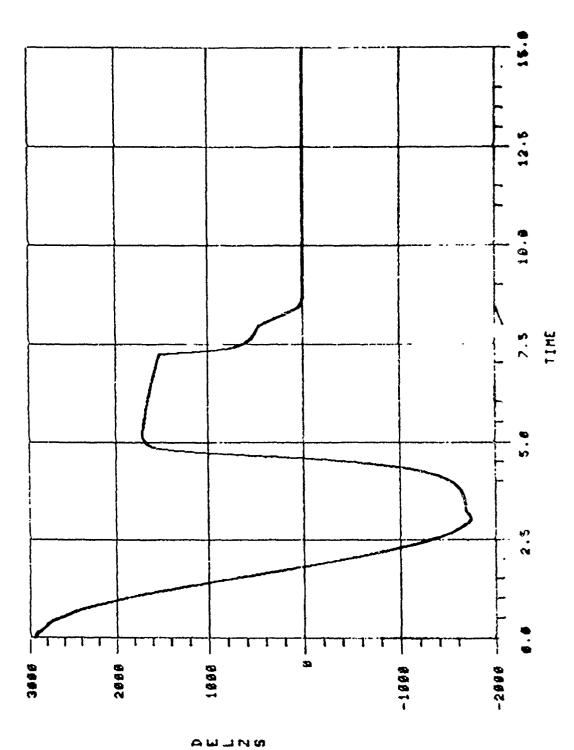
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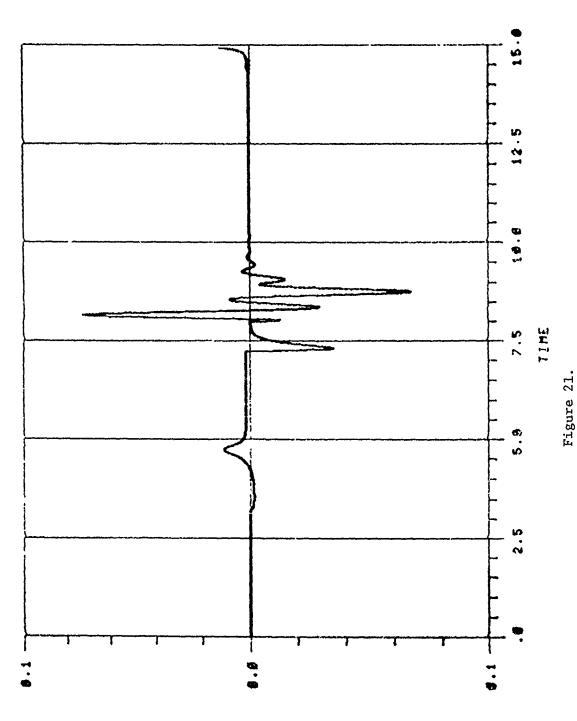


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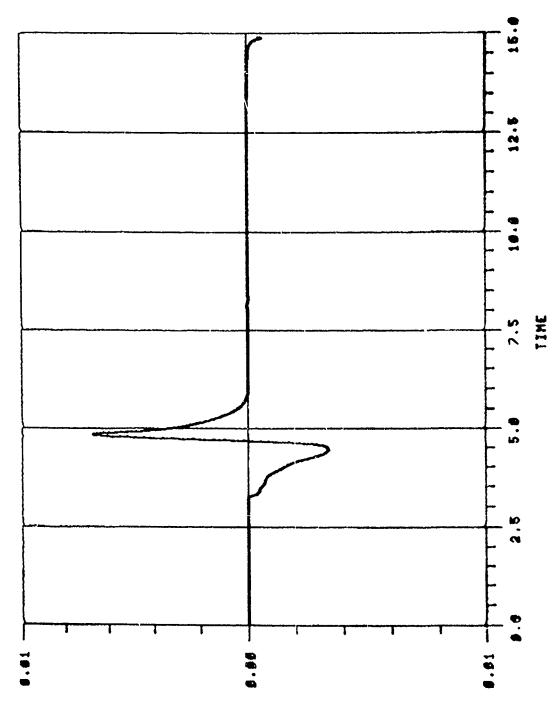


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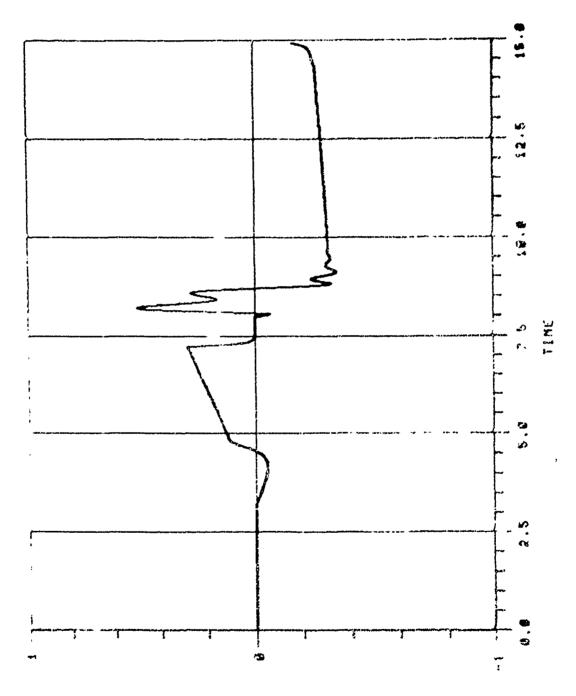


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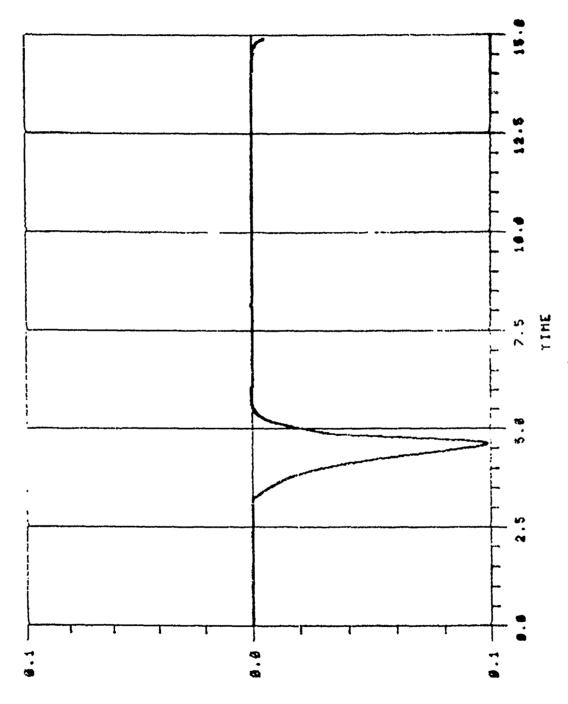
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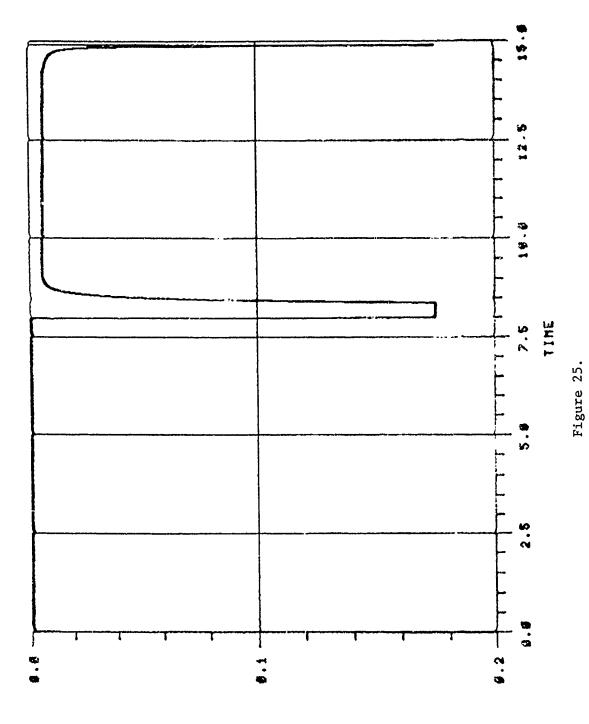


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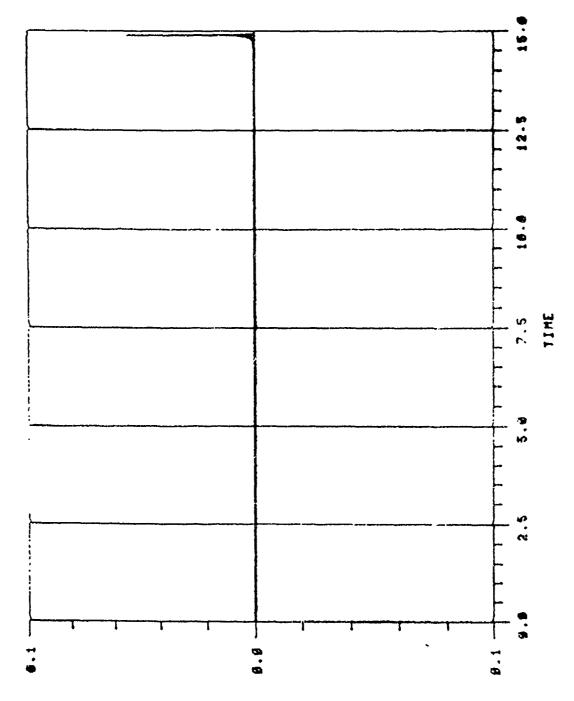
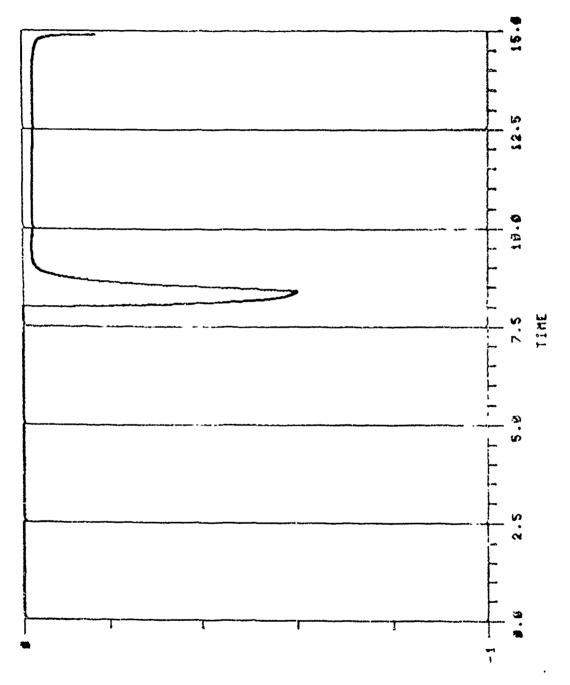


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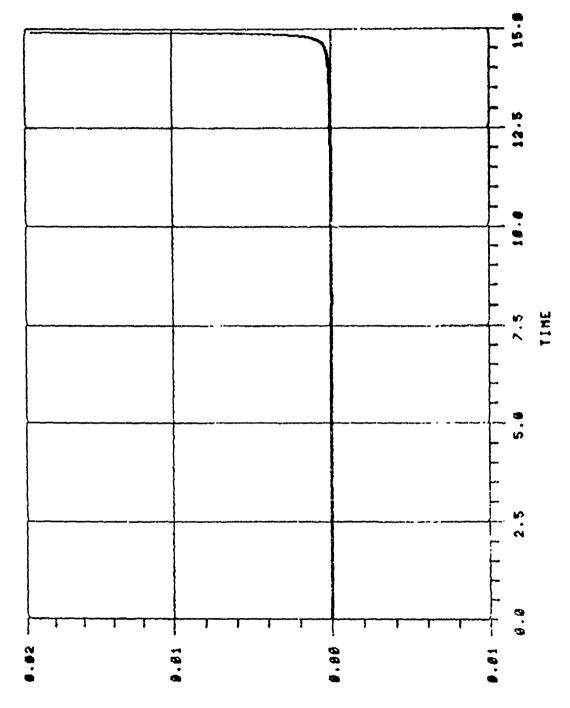
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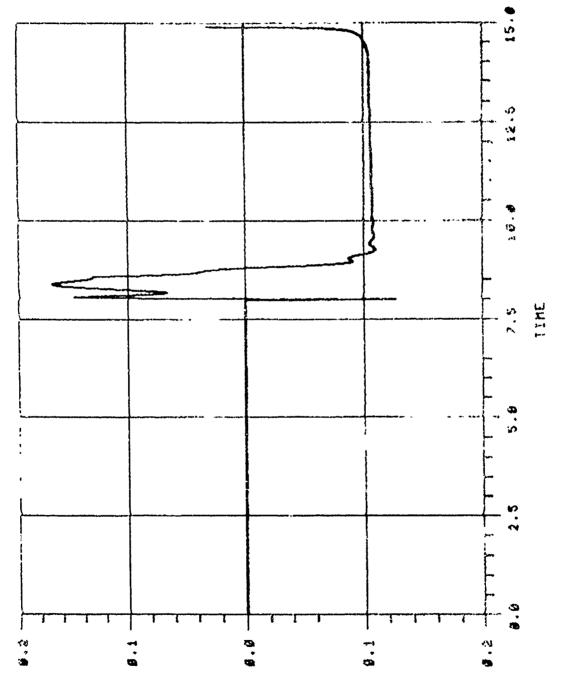


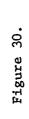
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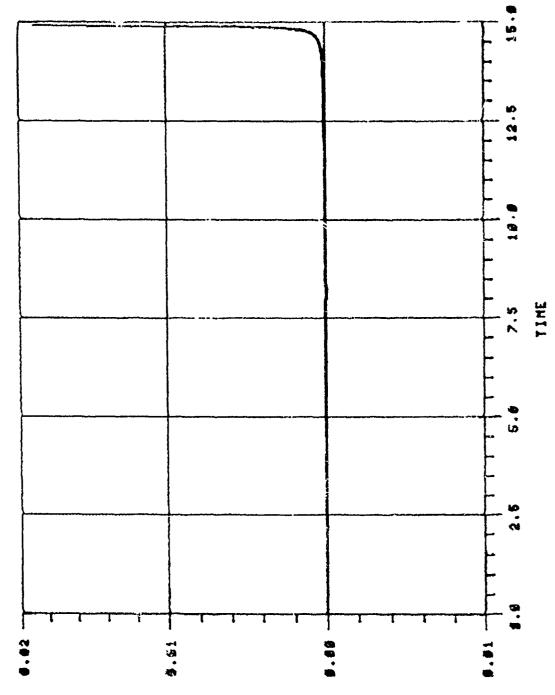
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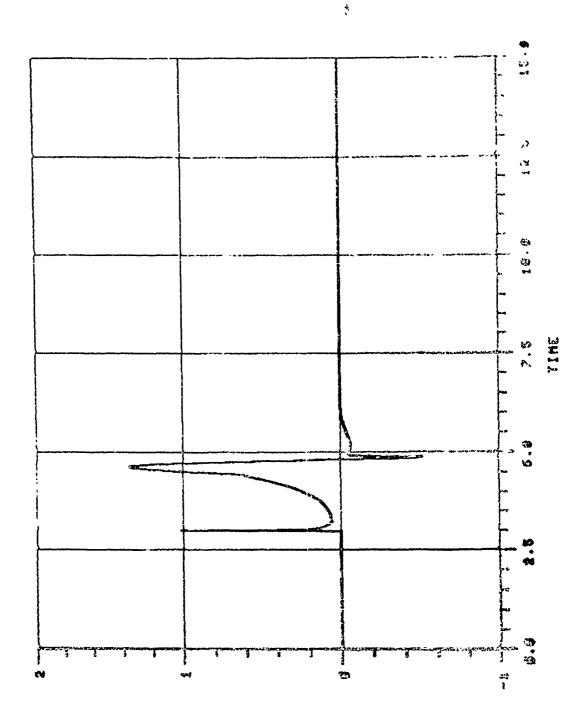












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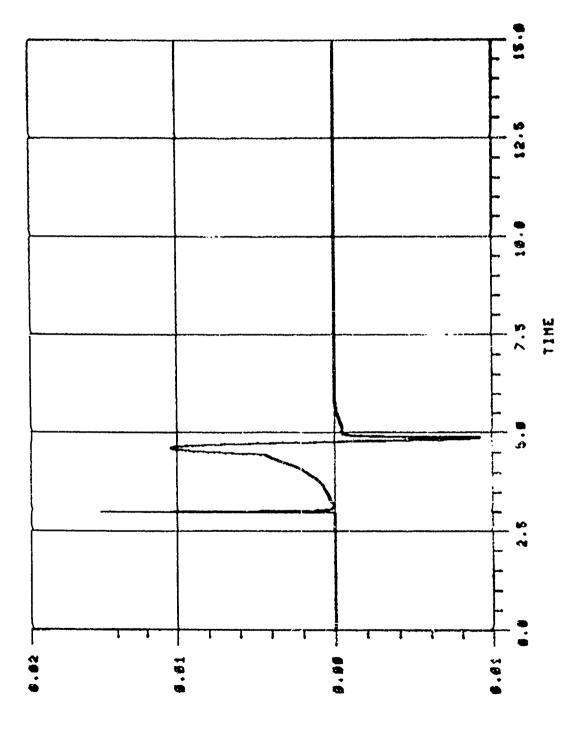
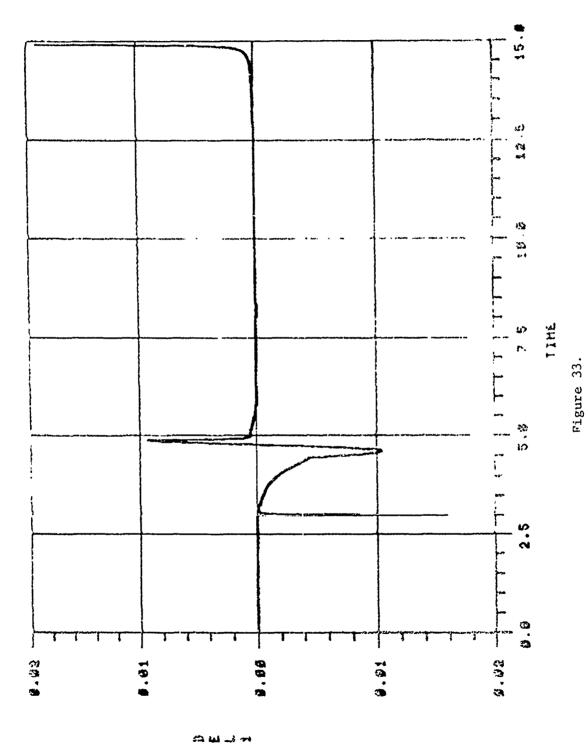
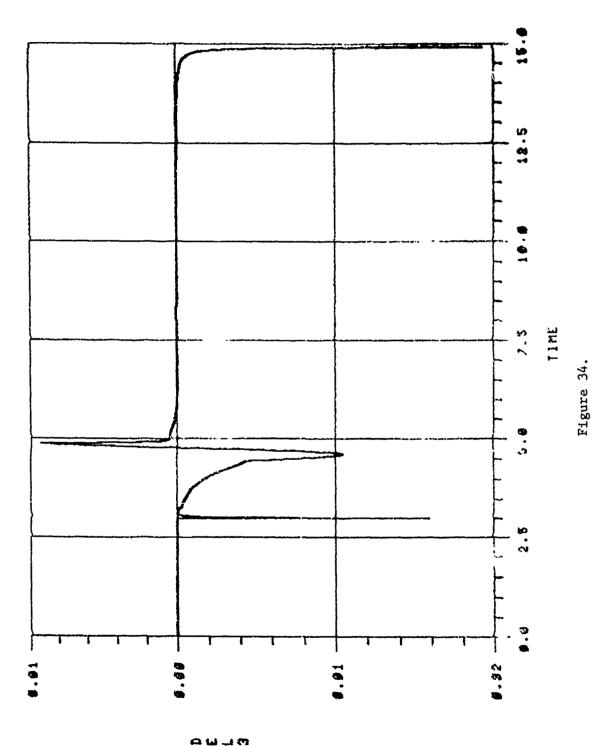
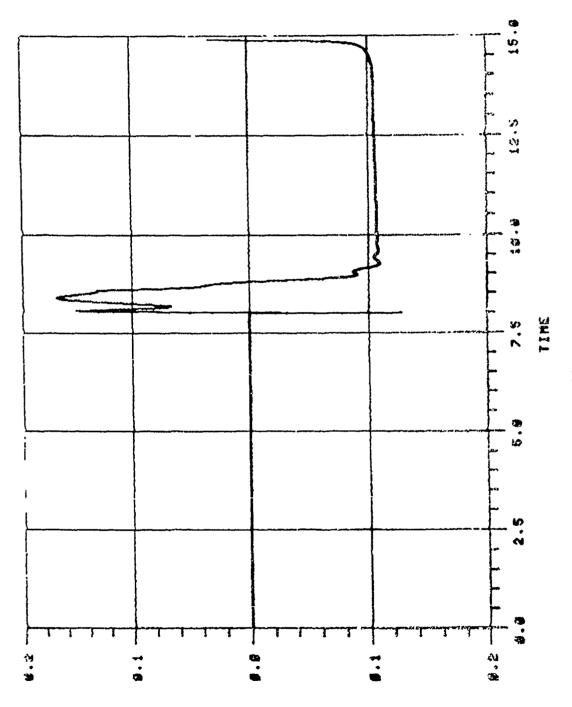


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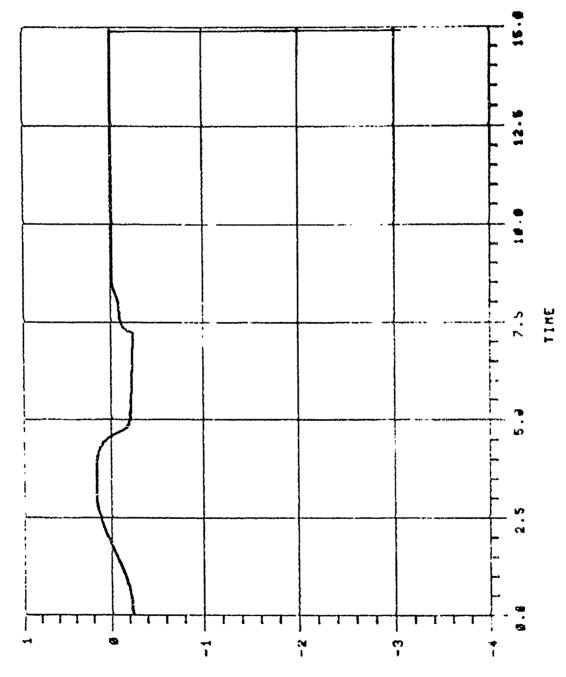


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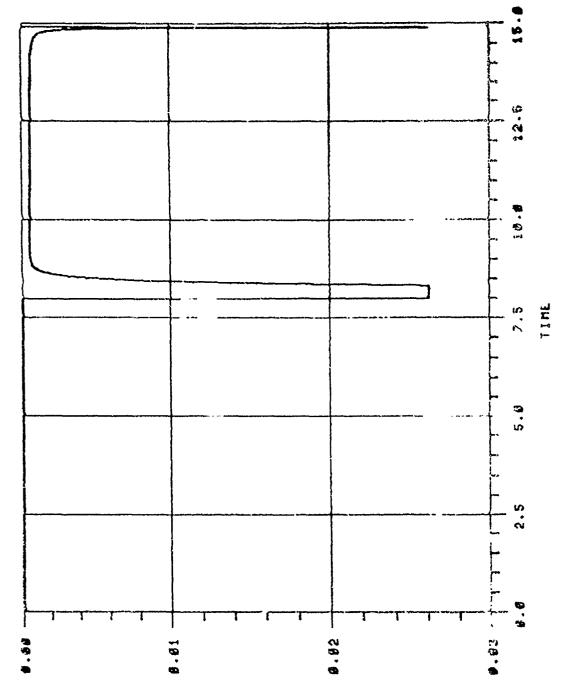
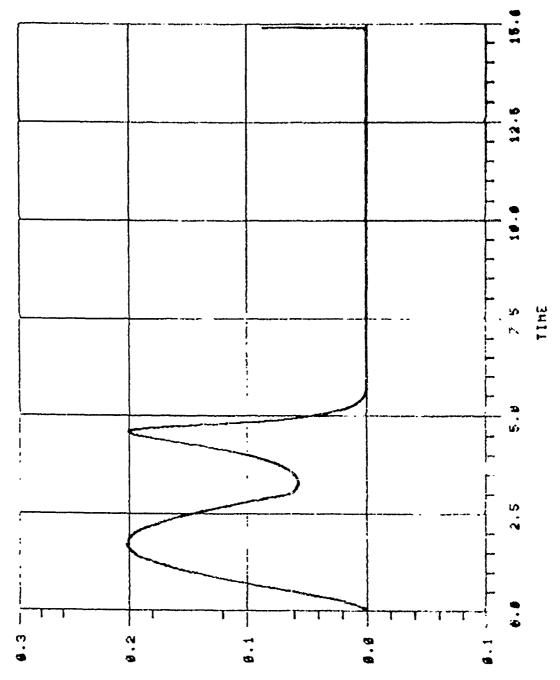
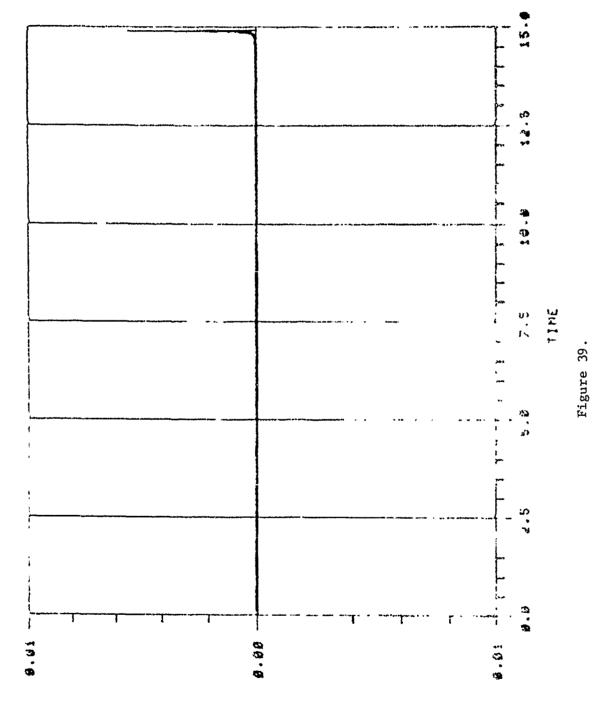


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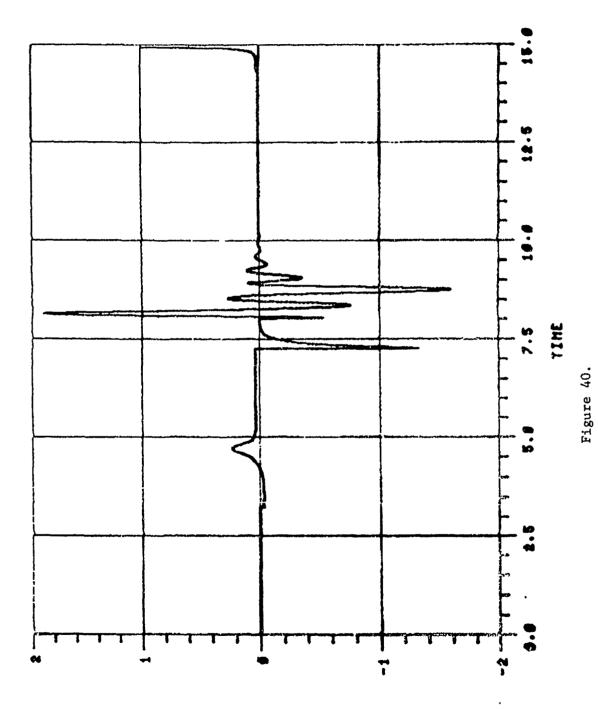


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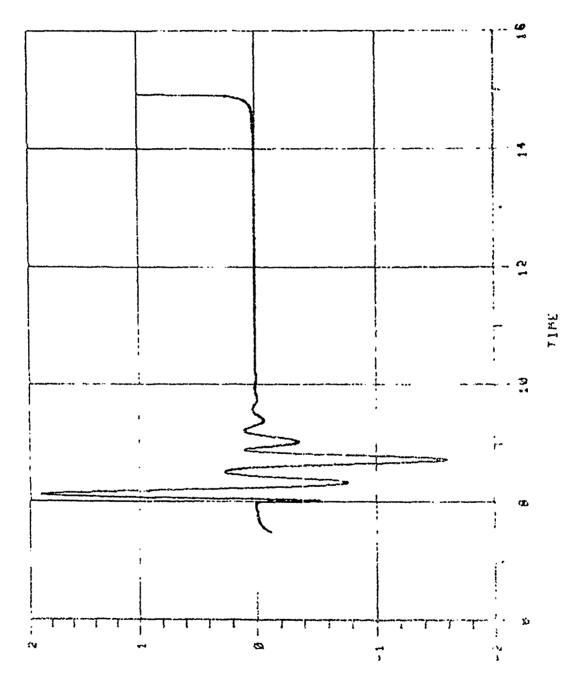
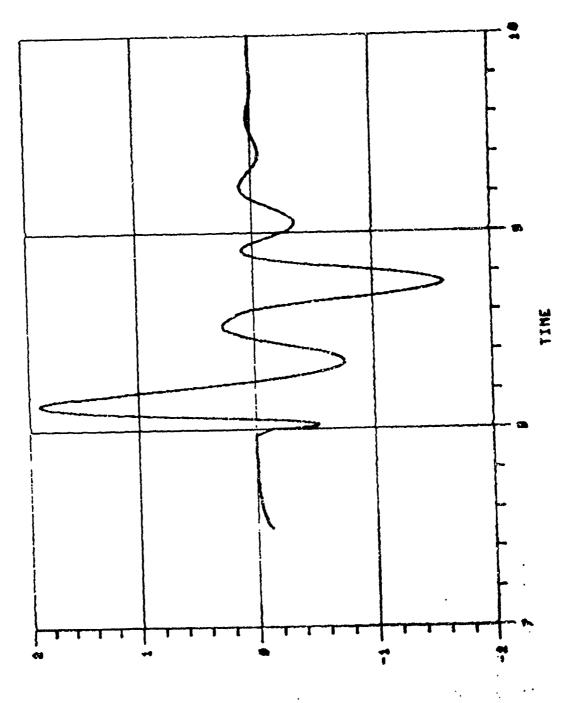
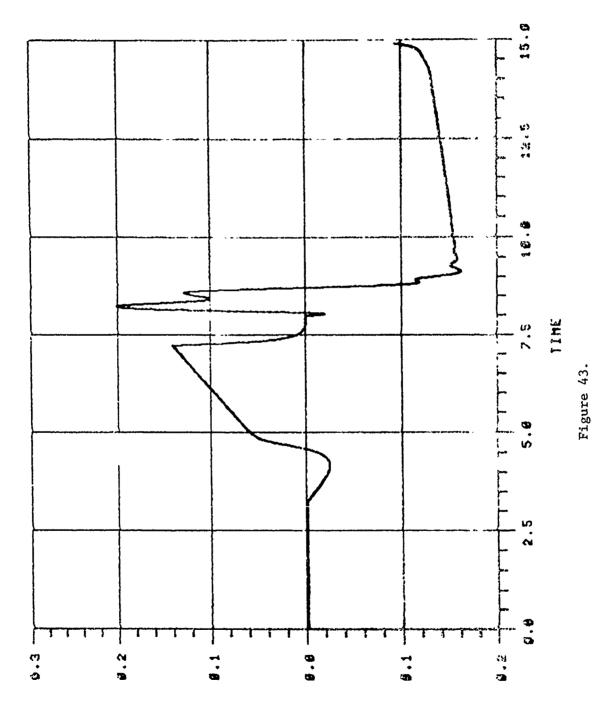
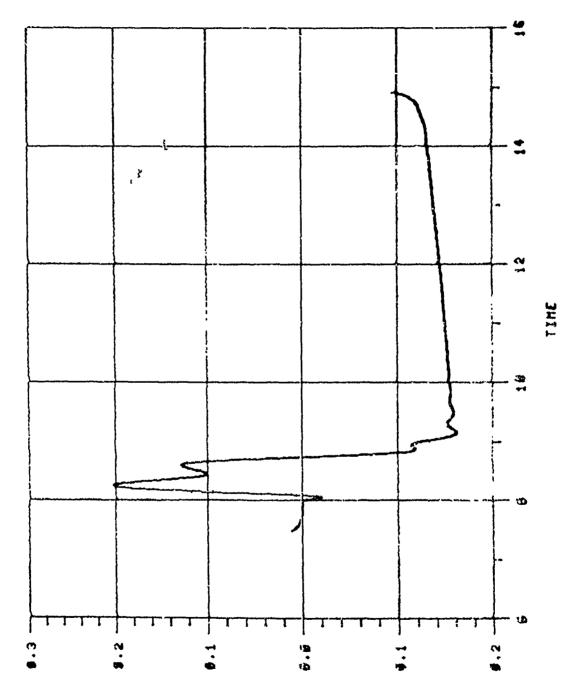


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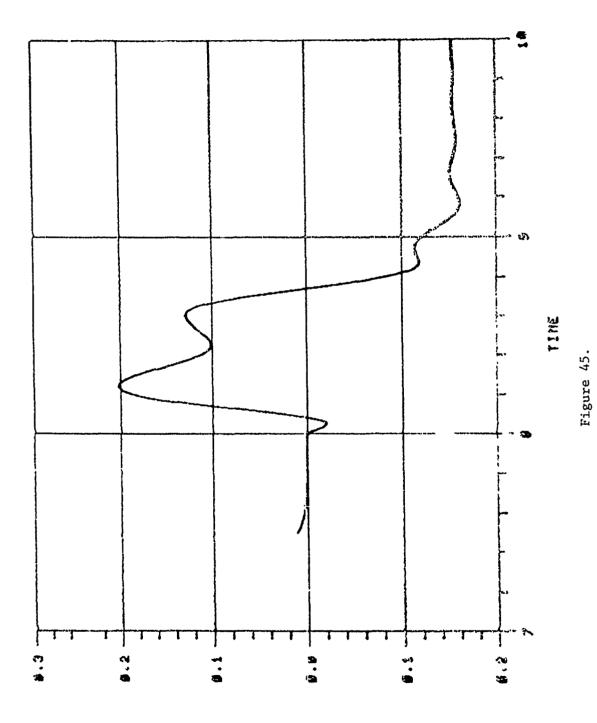


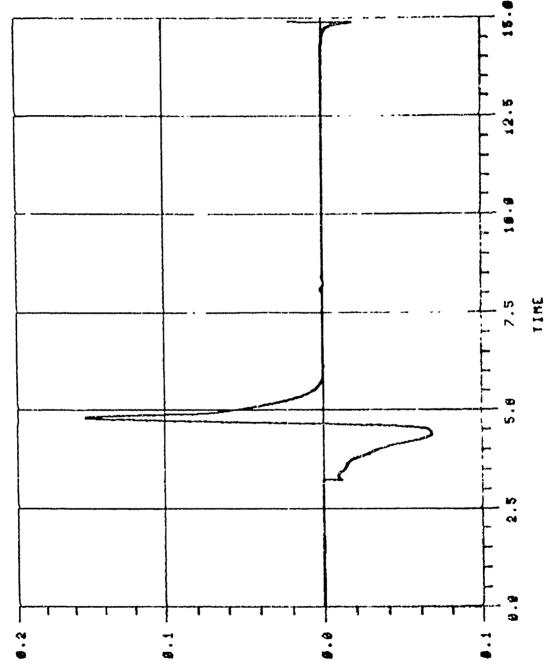




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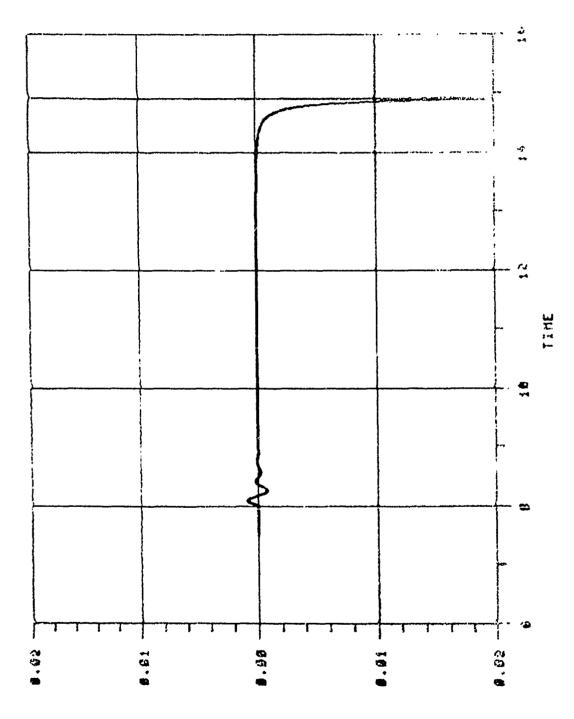




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Figure 46.

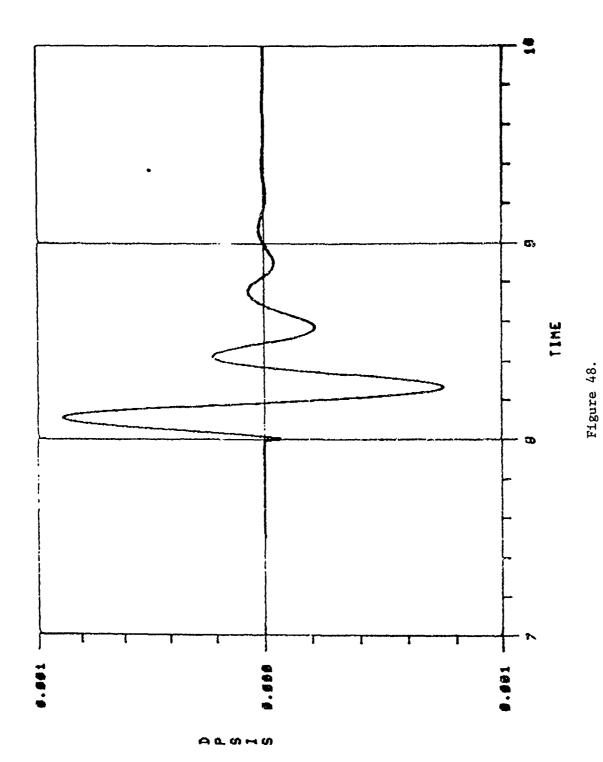
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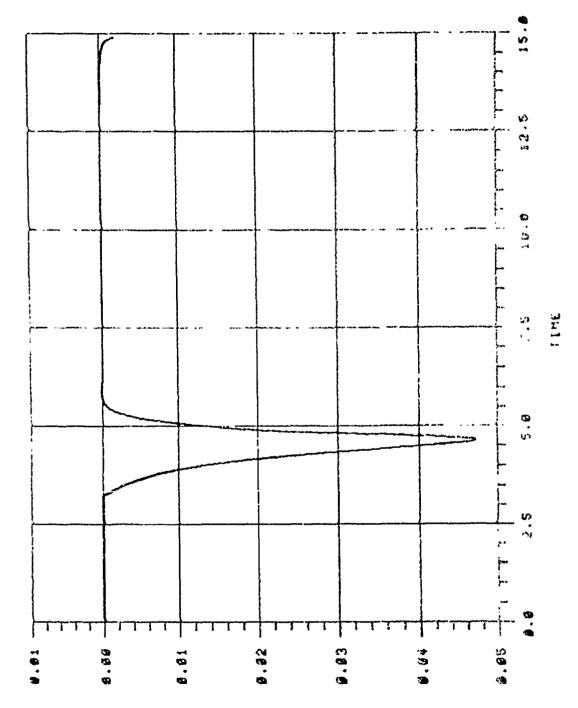
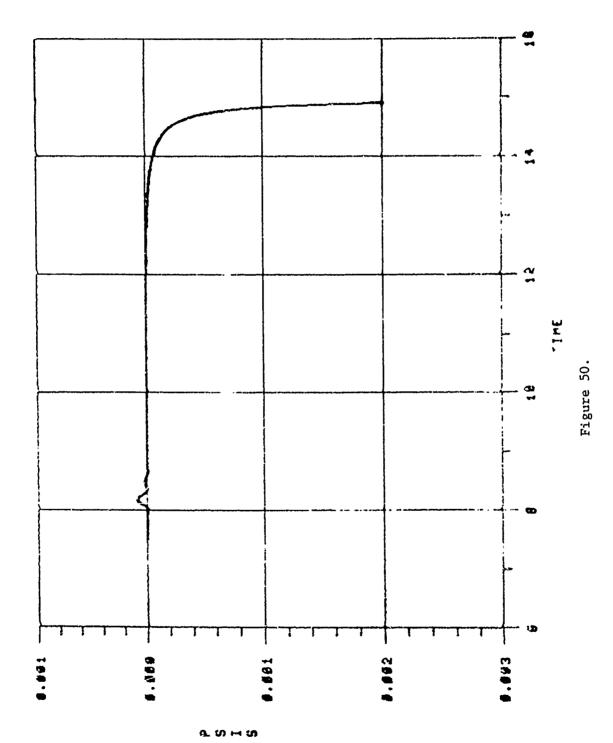
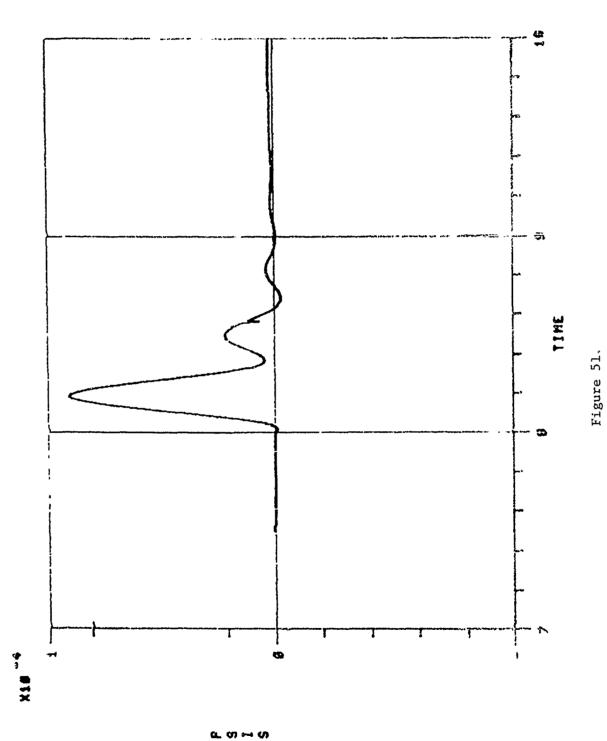


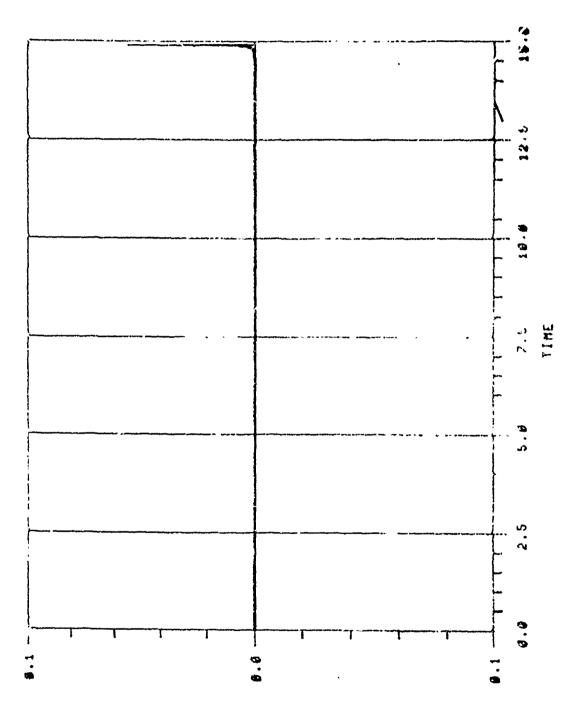
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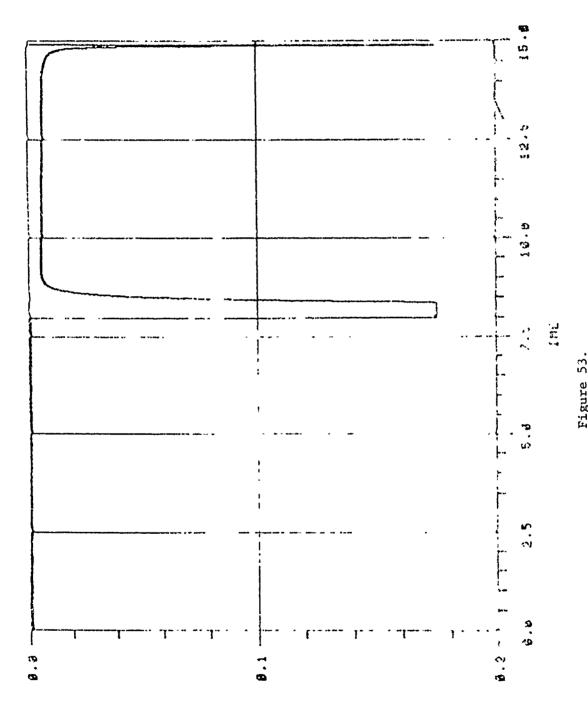
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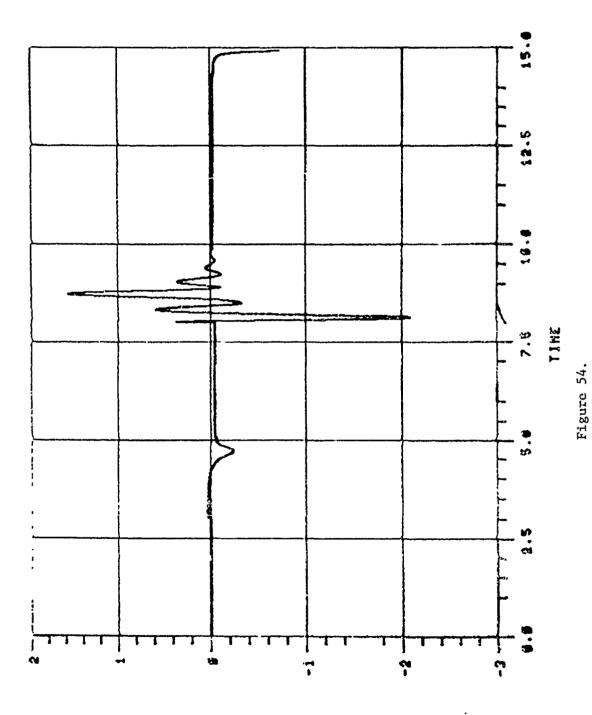




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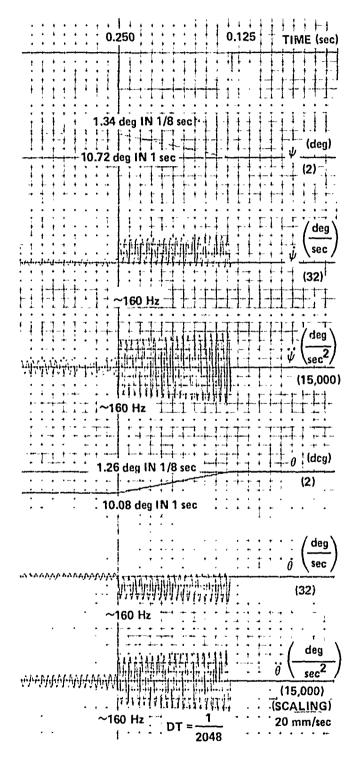
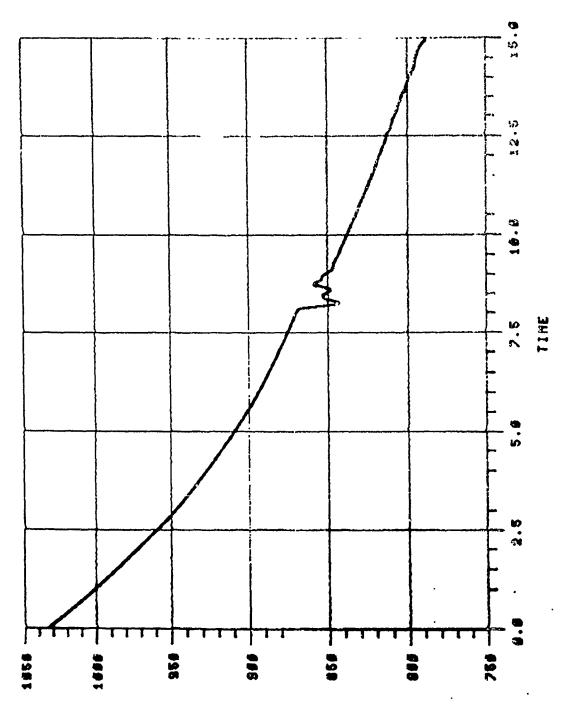
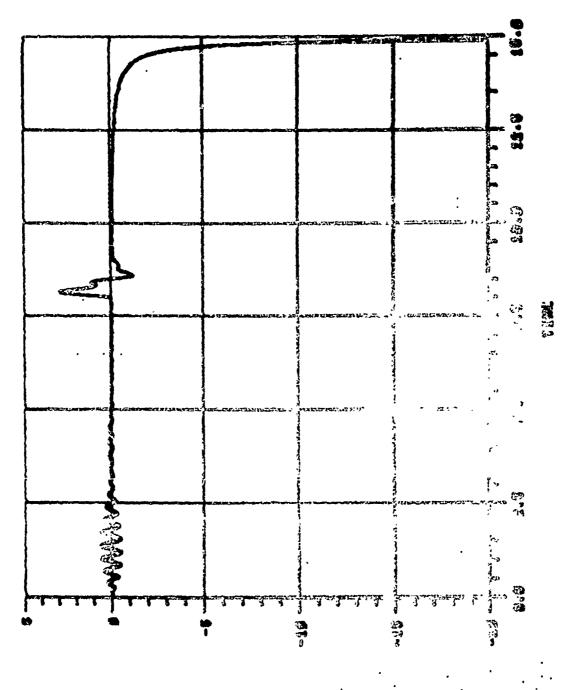


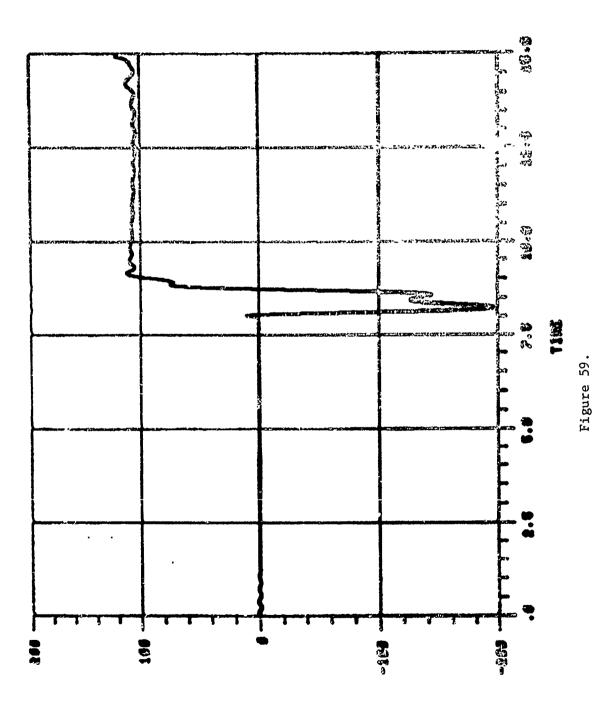
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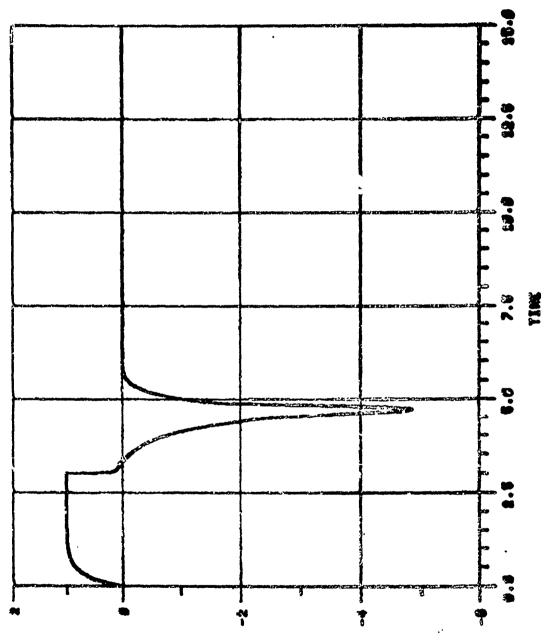
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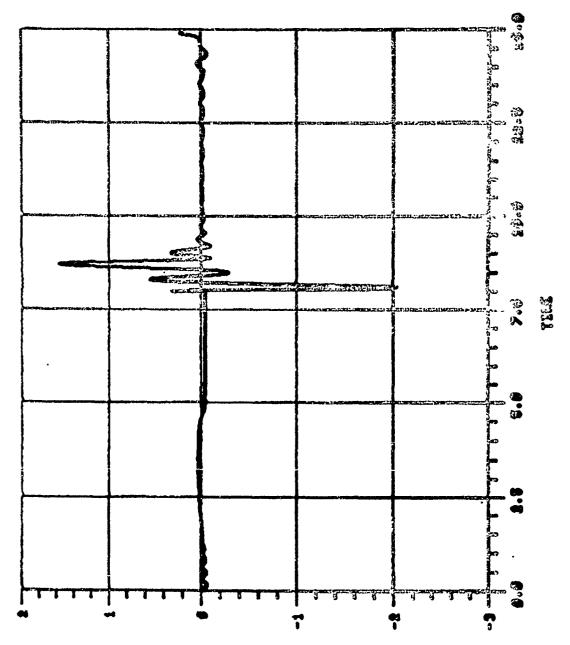
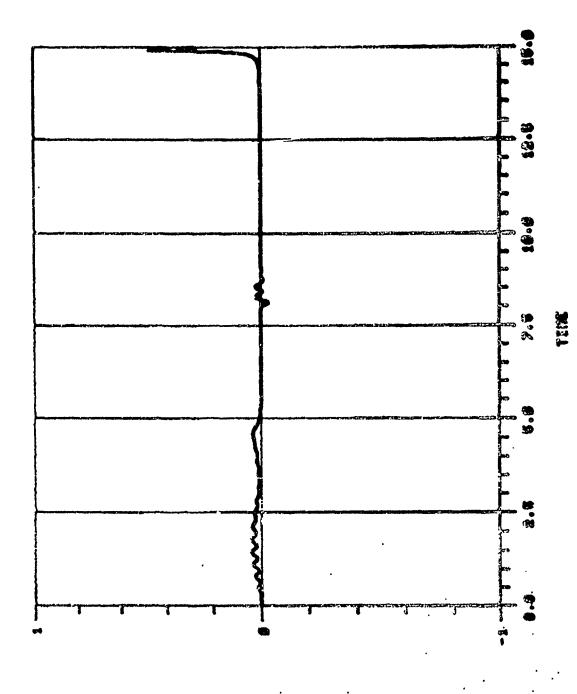


Figure 61.



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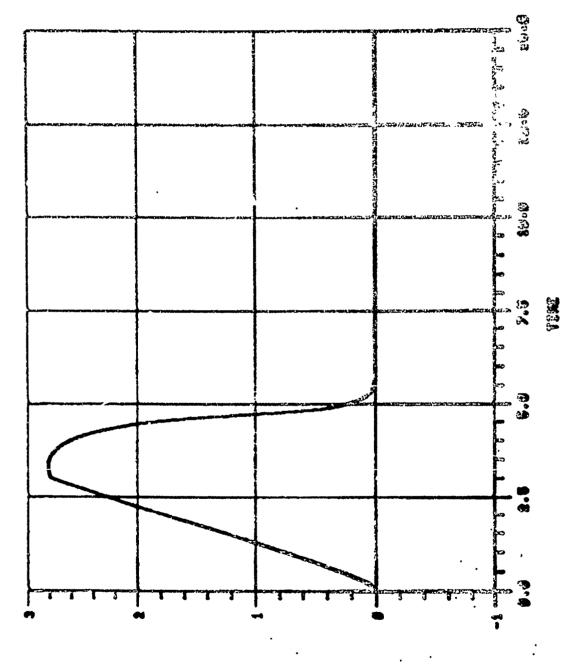
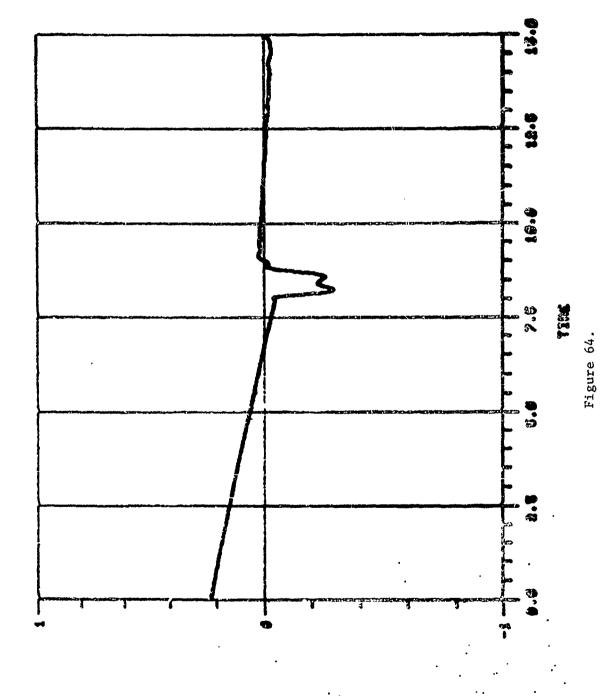
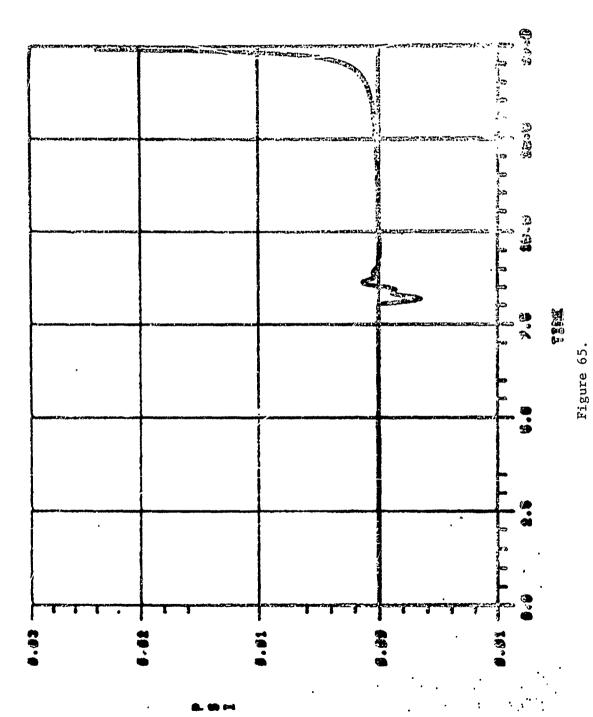
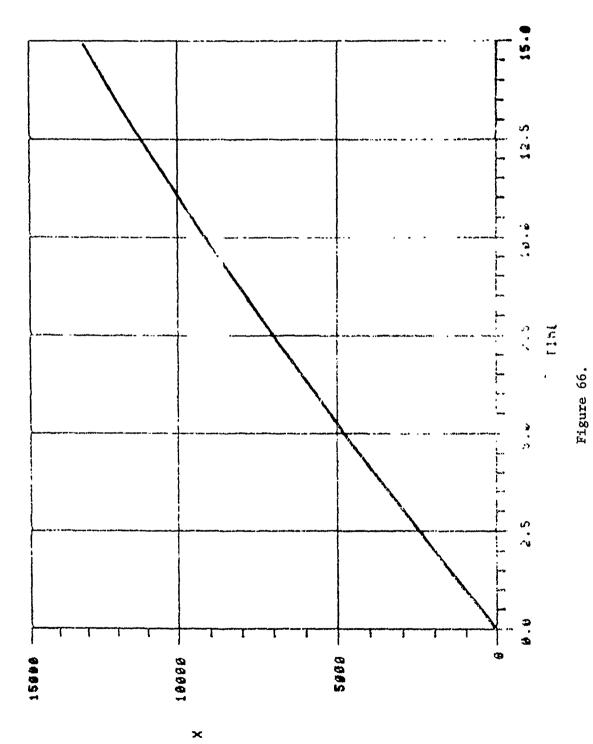


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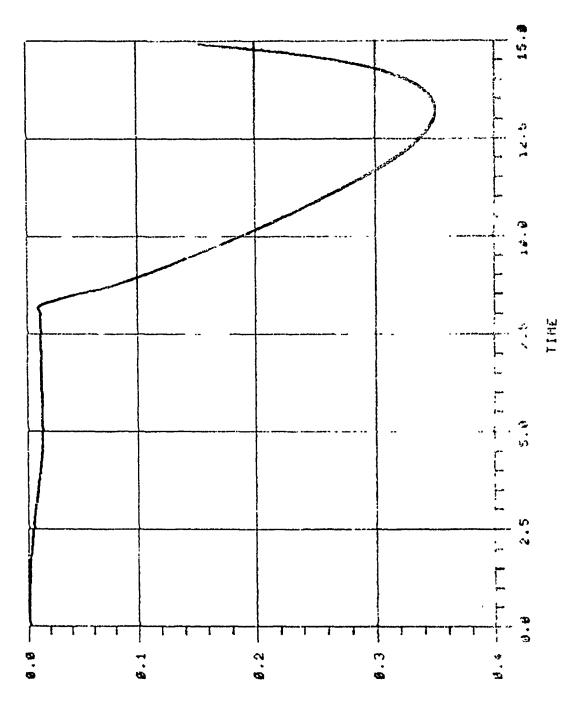
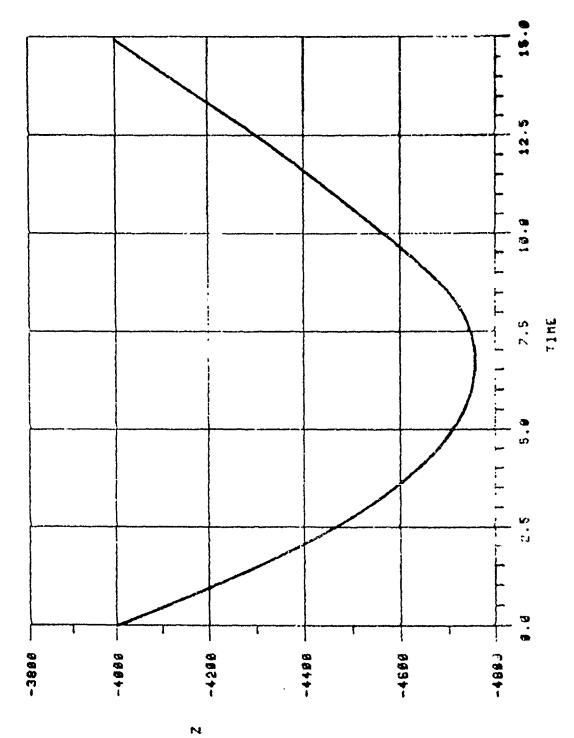
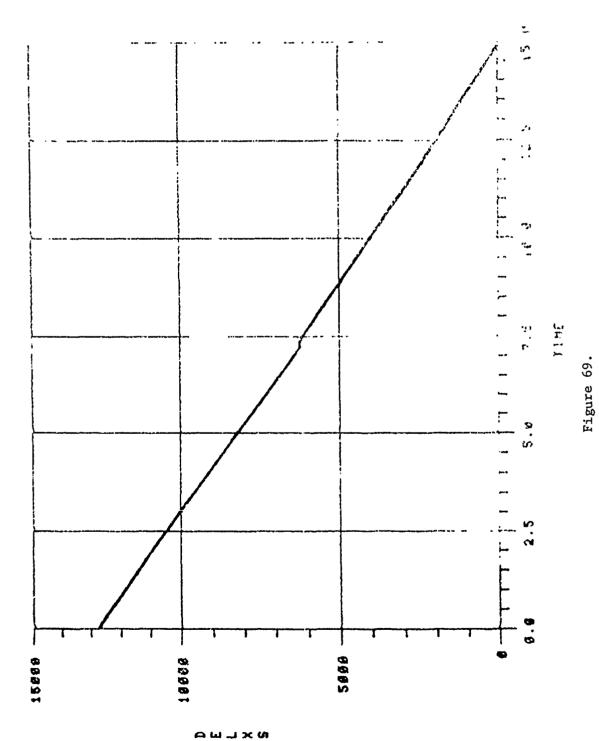


Figure 67.

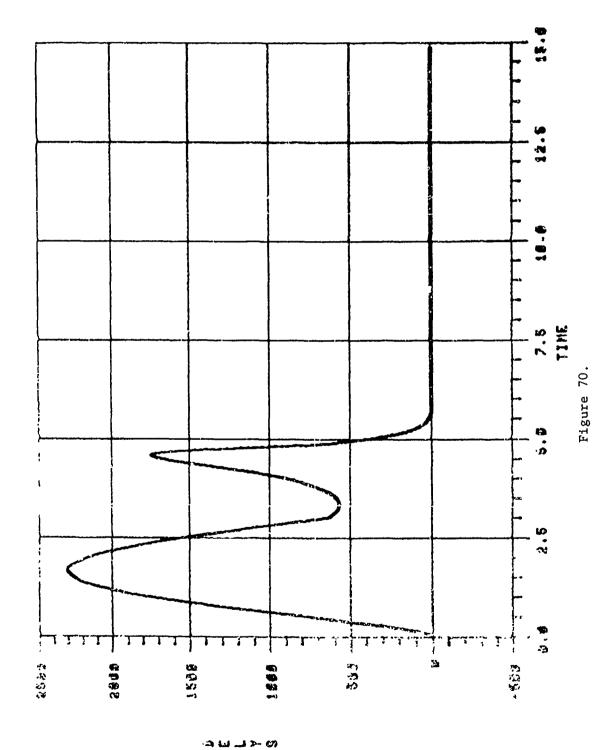


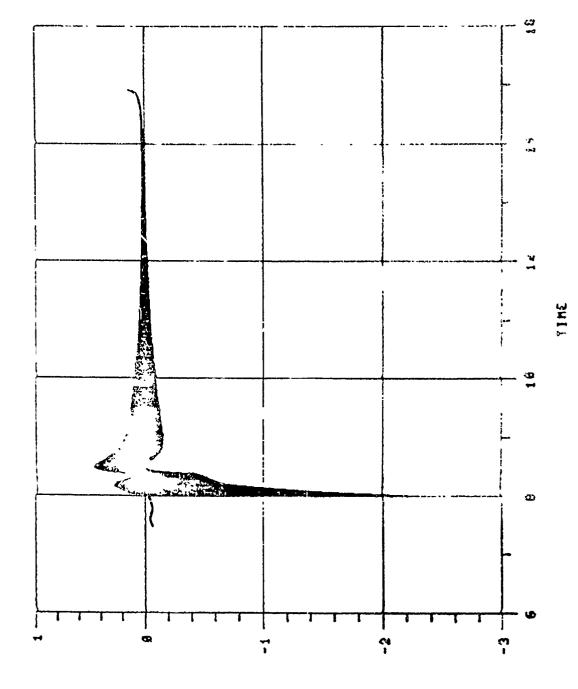
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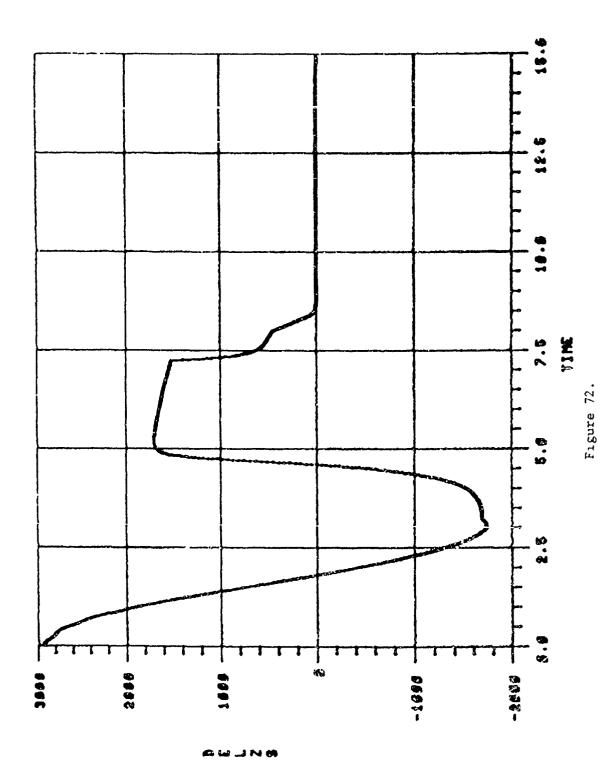


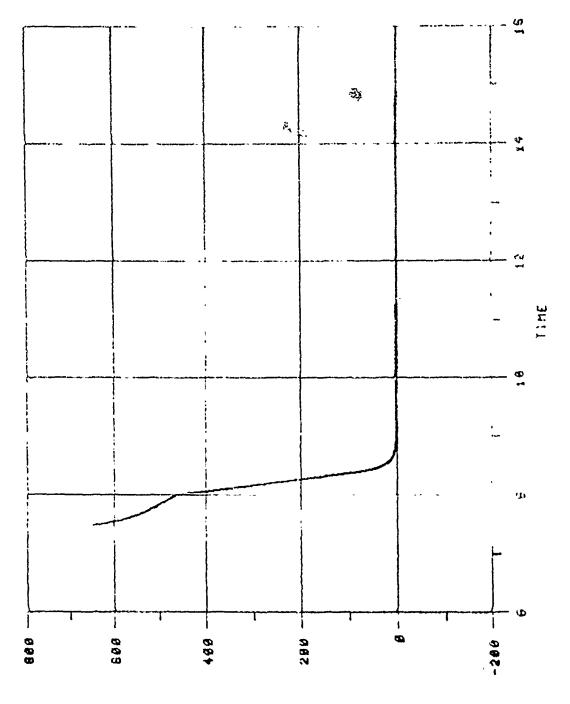


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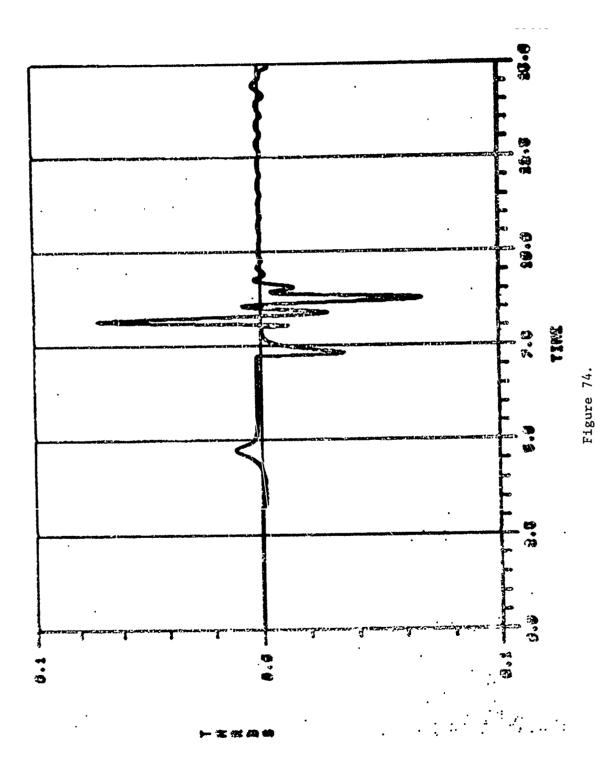
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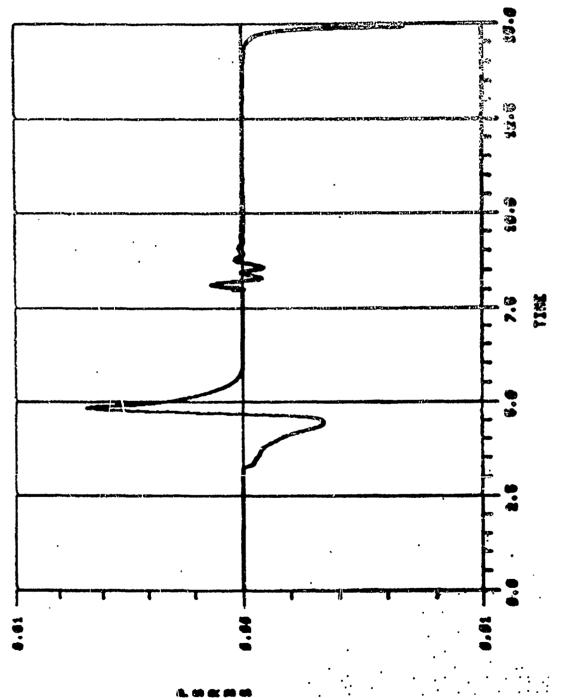
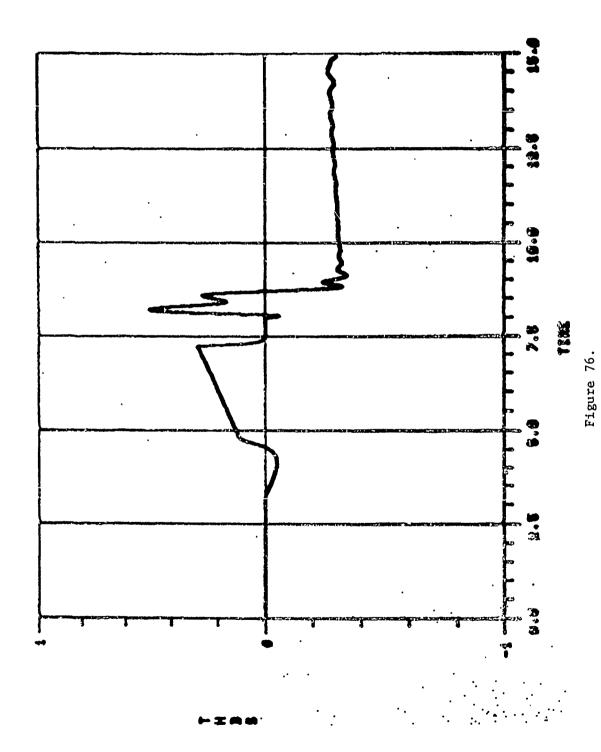


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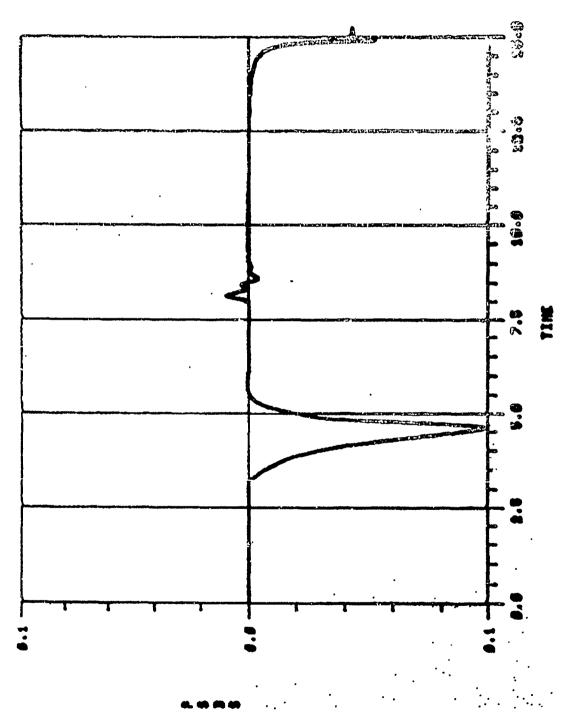
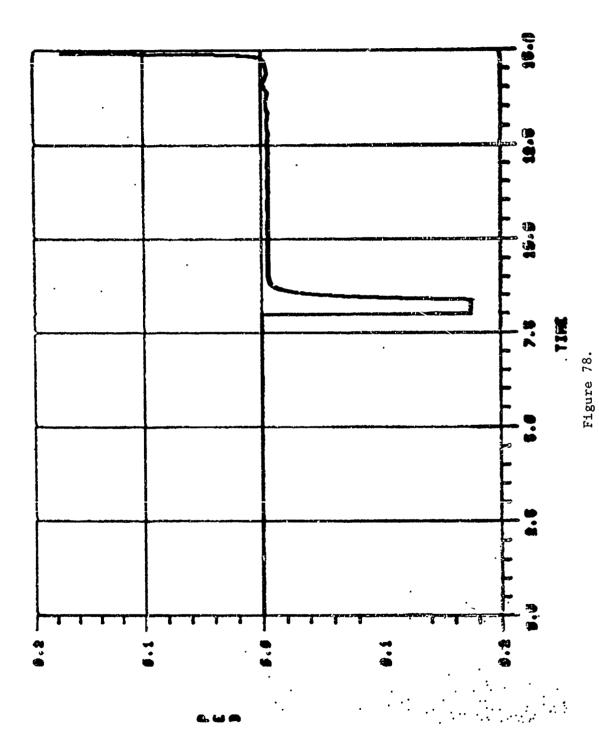


Figure 77.



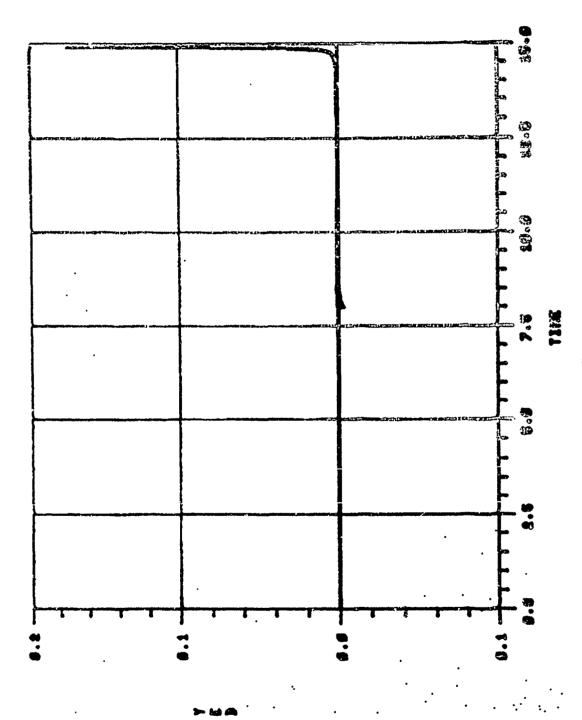
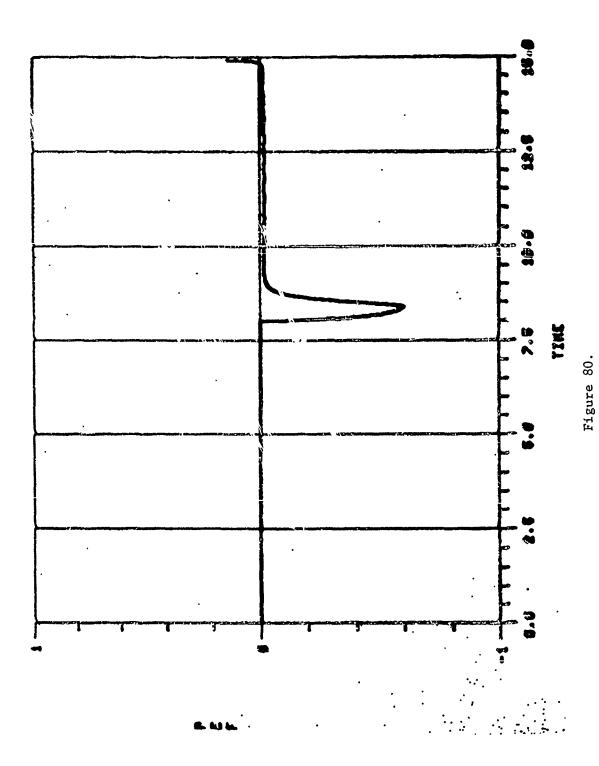


Figure 79.



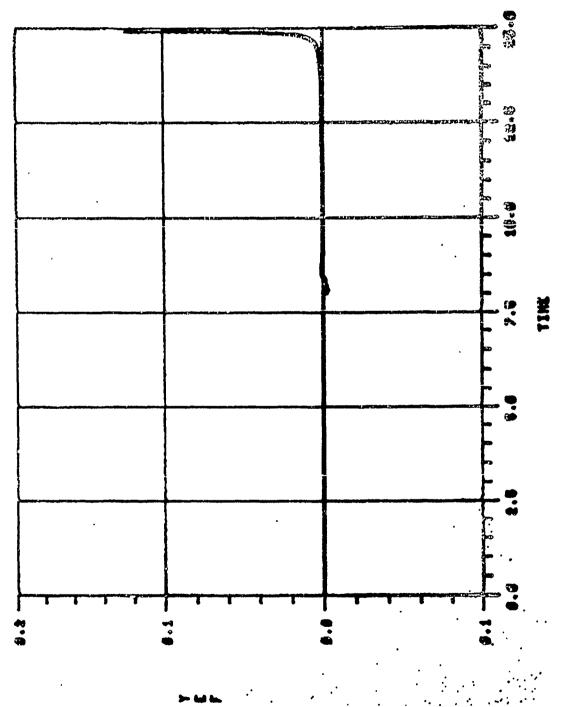
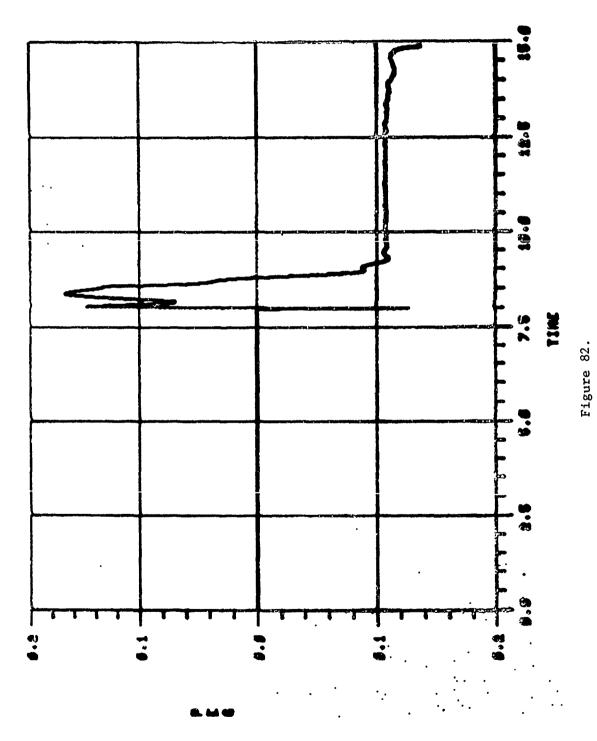


Figure 81.



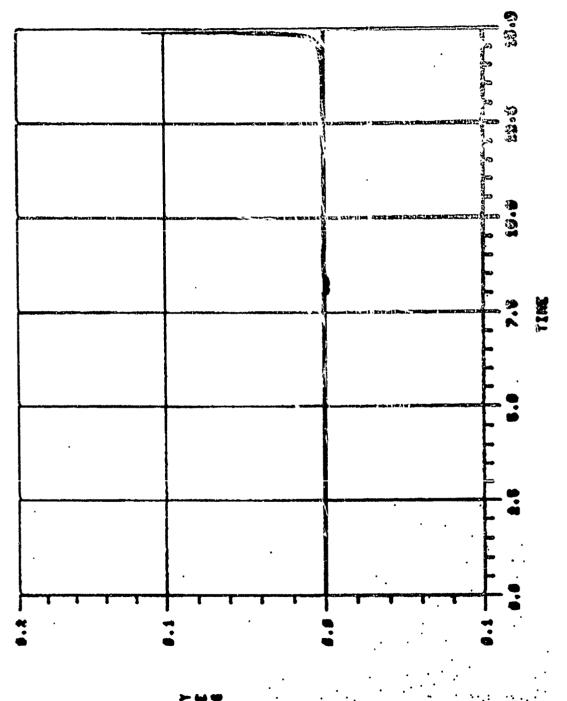


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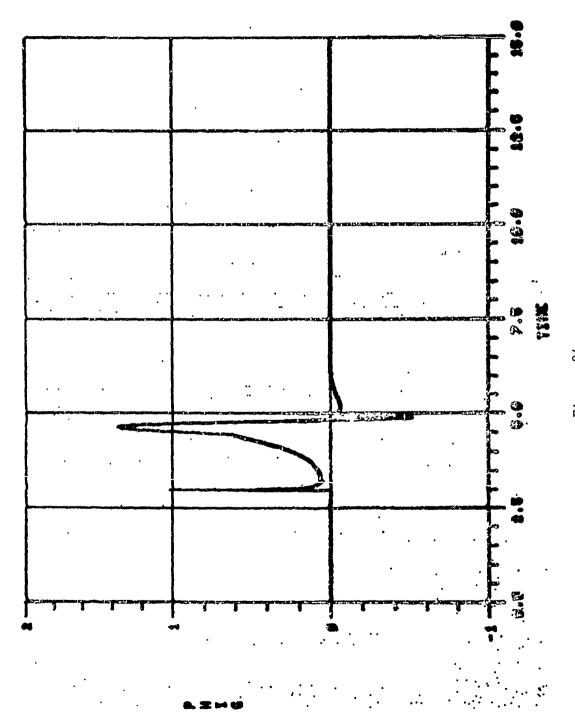
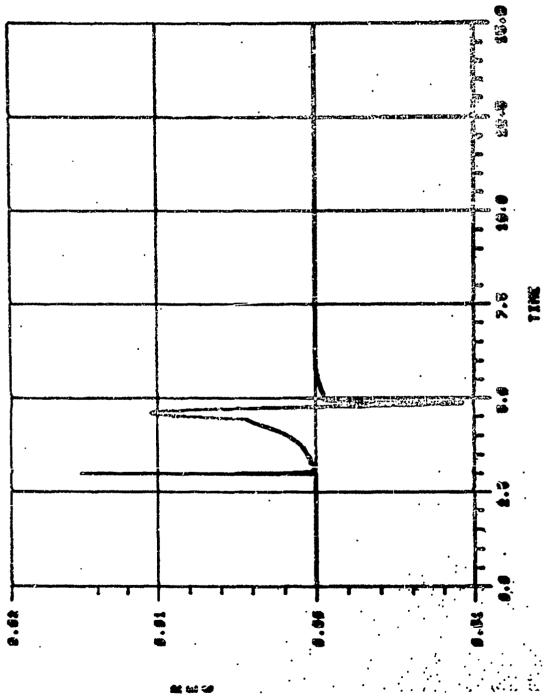


Figure 84.



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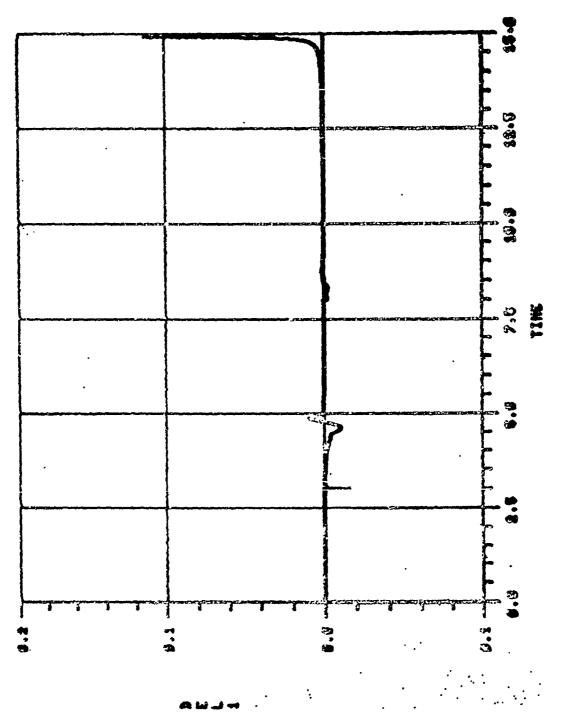
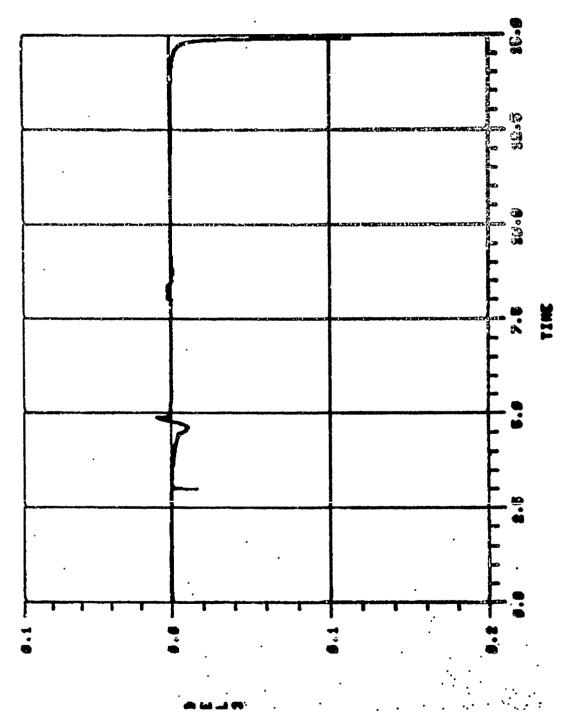


Figure 86.



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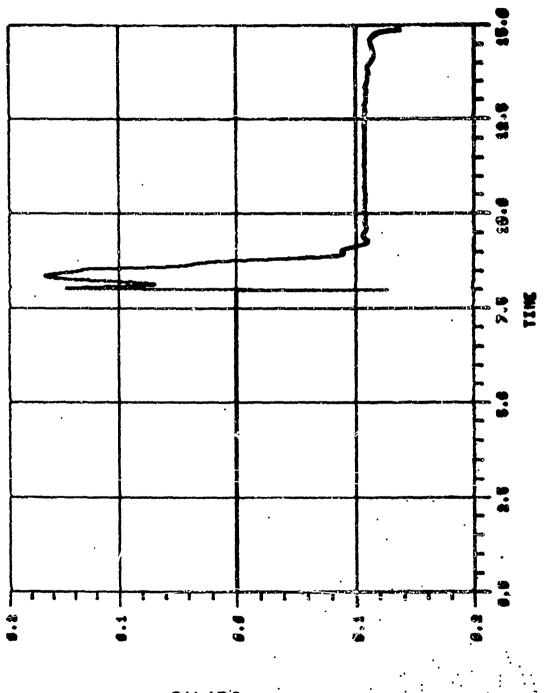
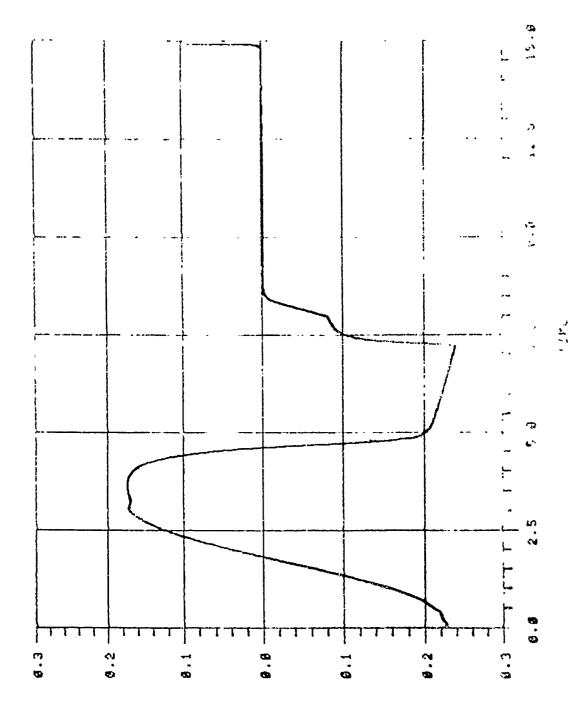


Figure 88.



igure 89.

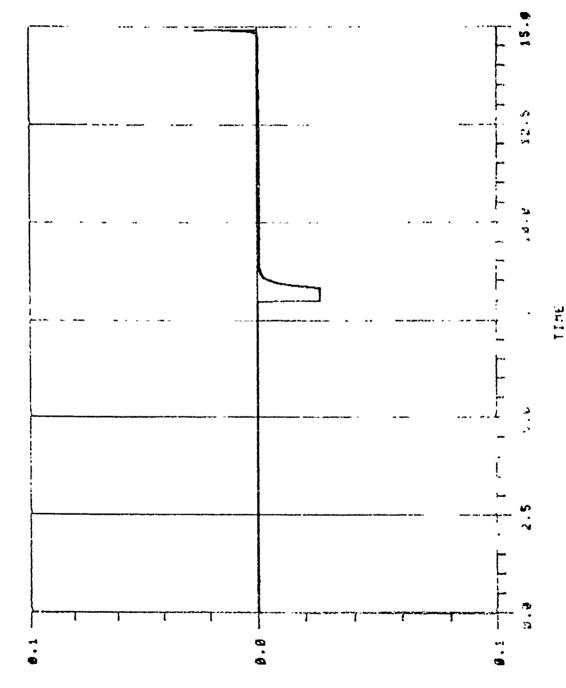
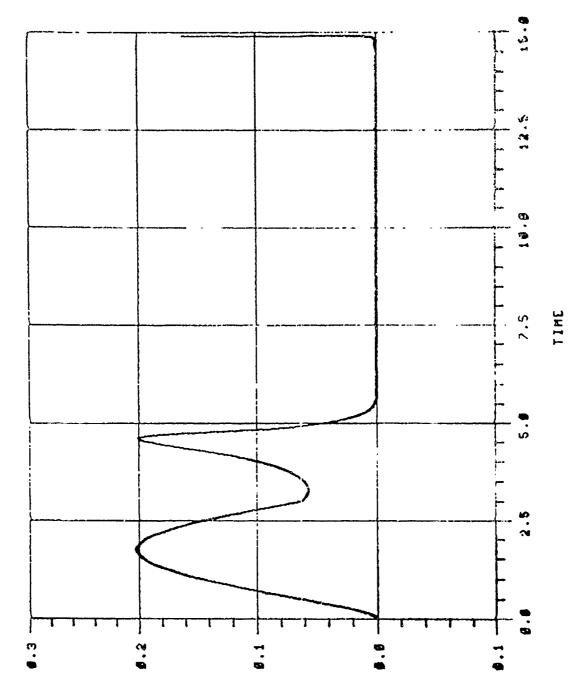


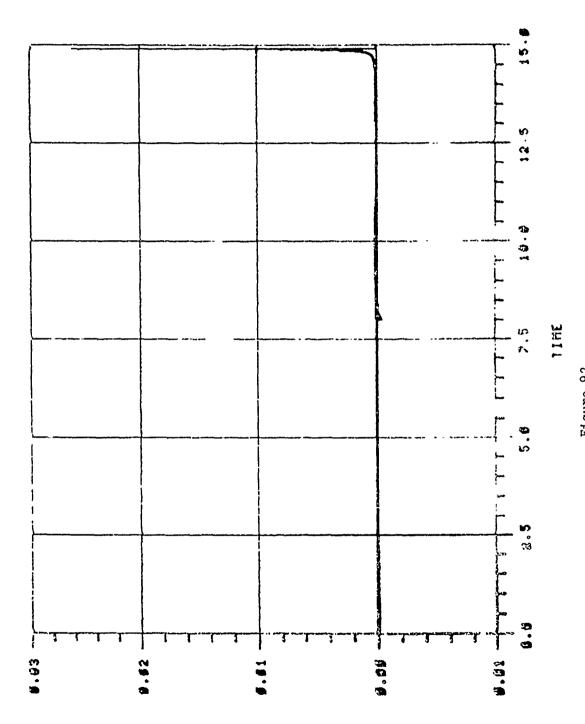
Figure 90.

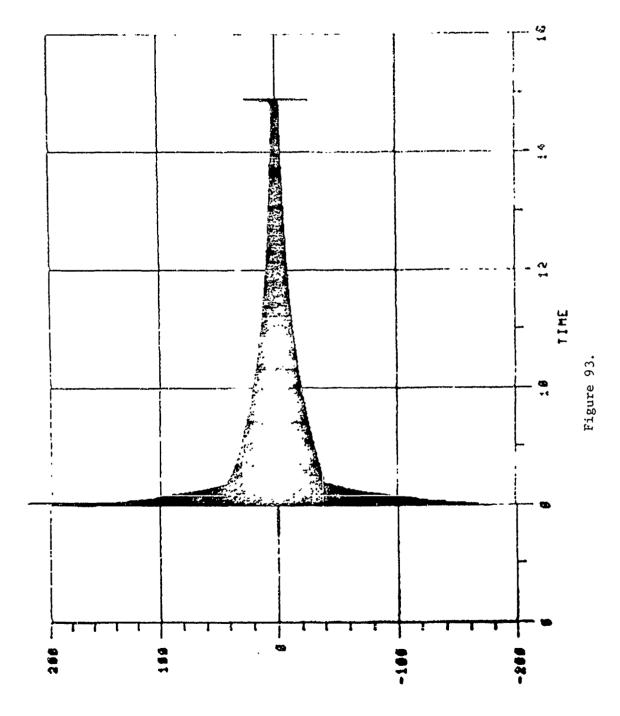


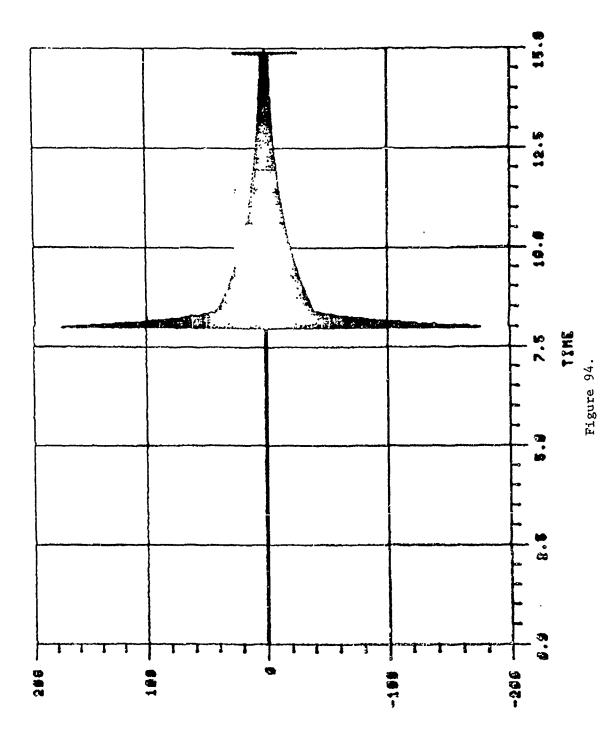
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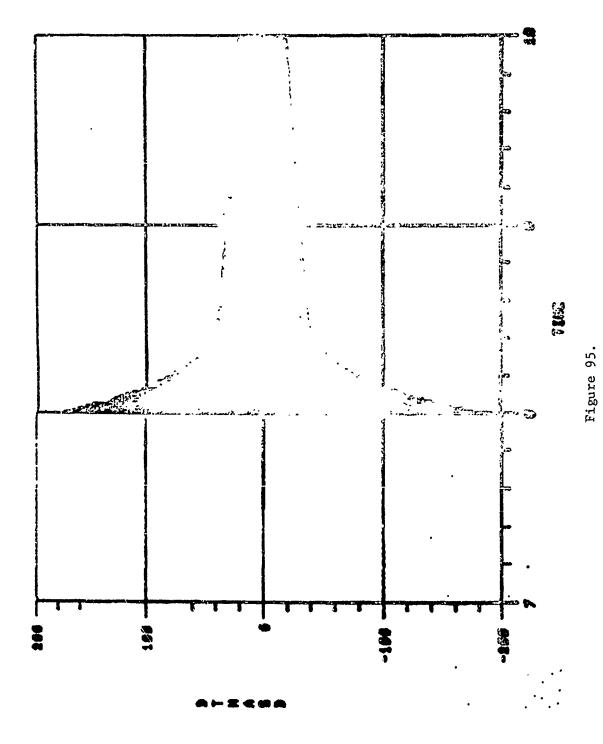
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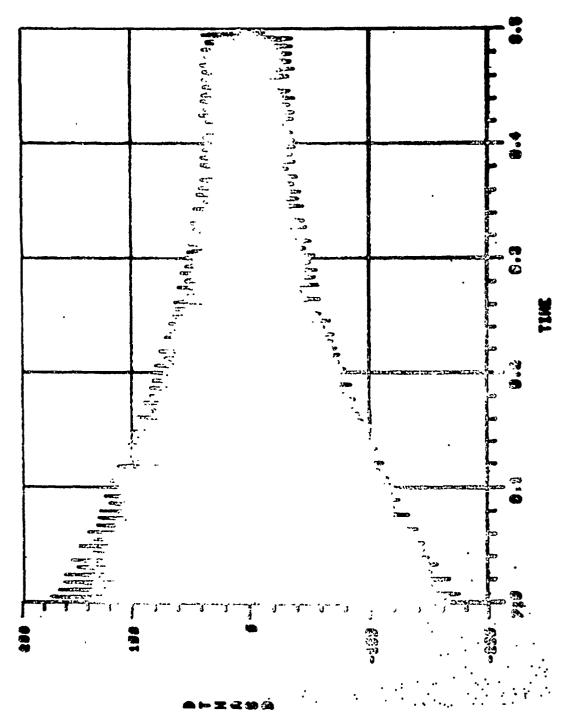
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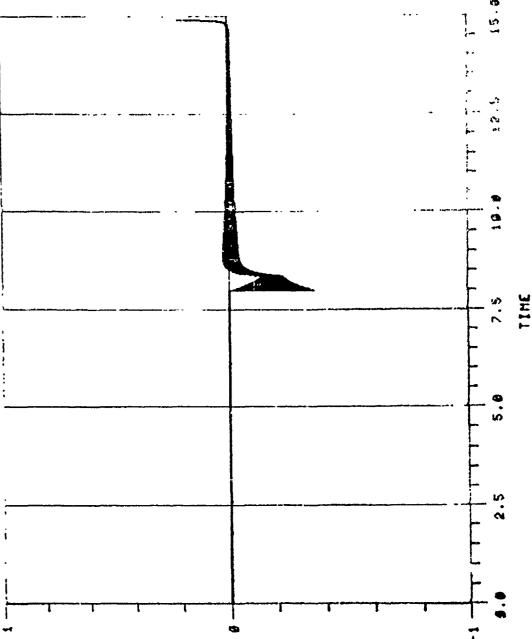


Figure 97.

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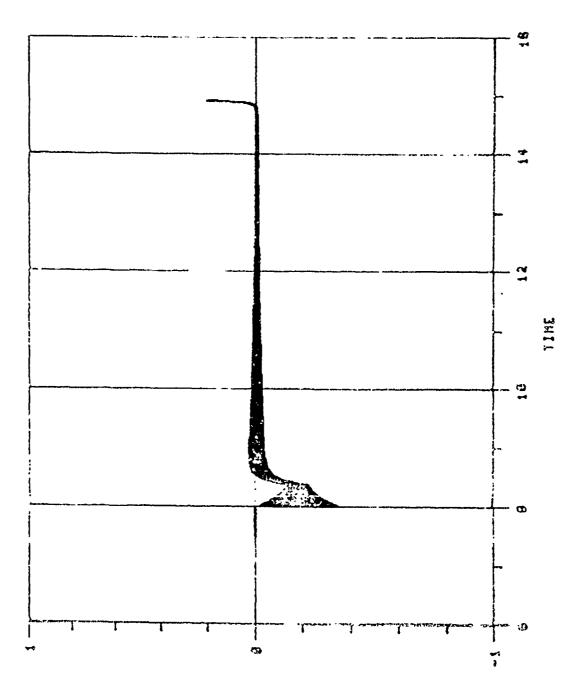
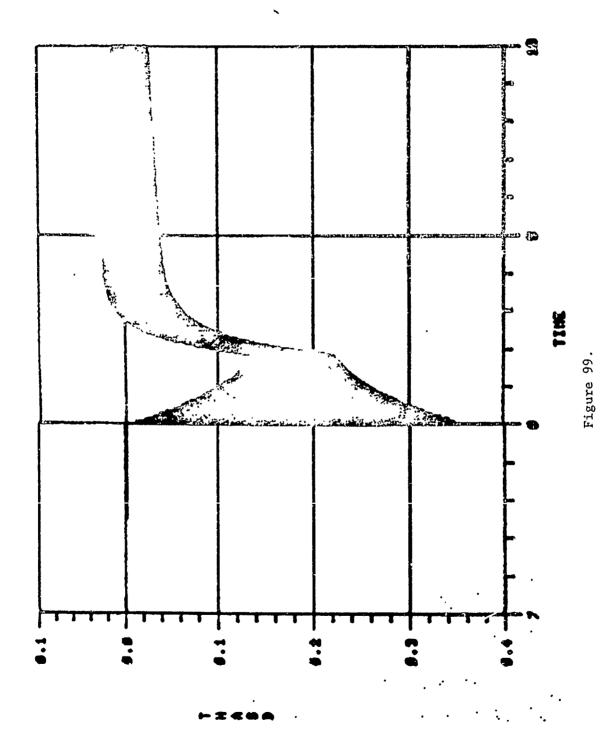
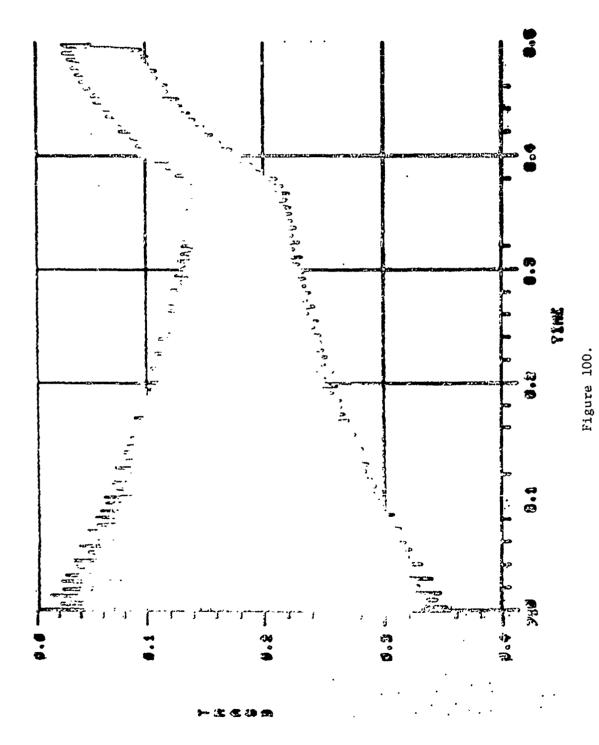


Figure 98.

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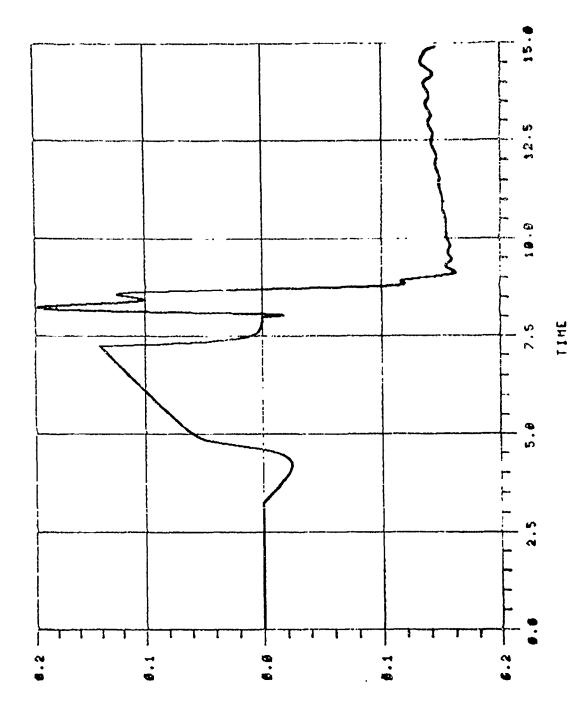
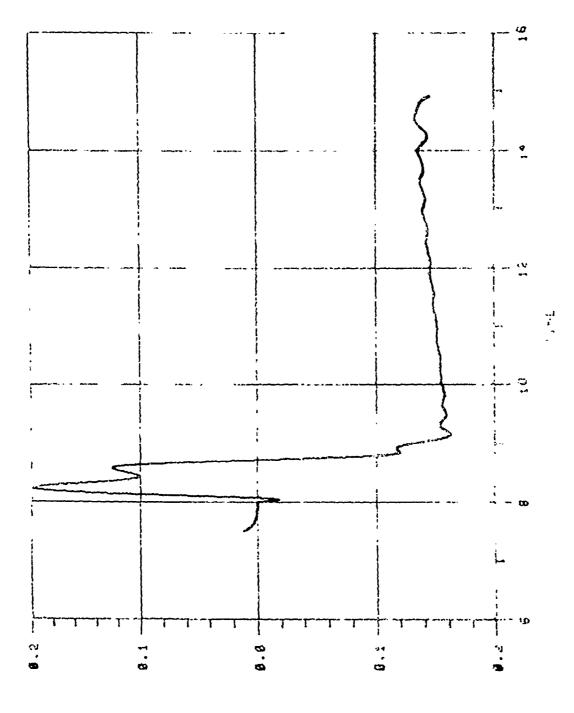
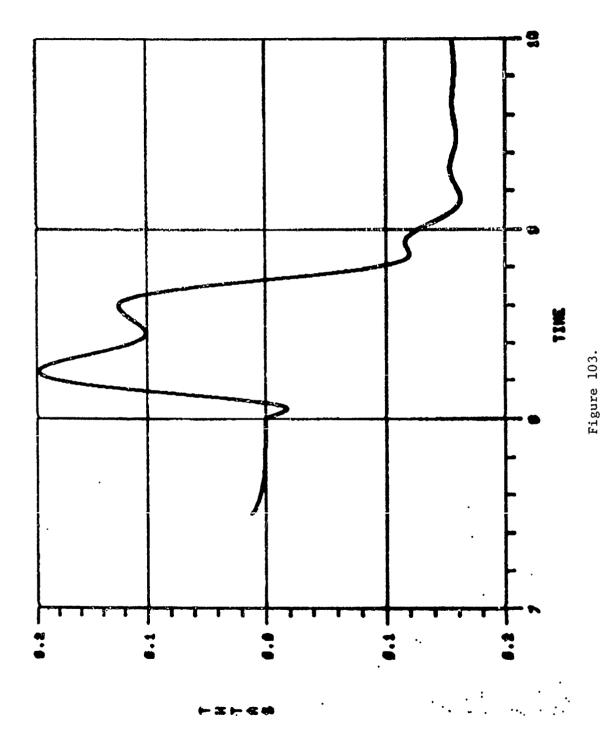


Figure 101.





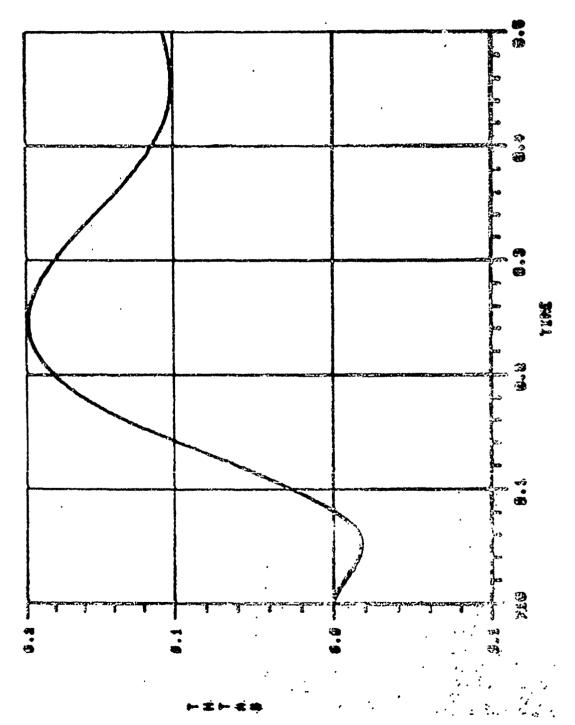
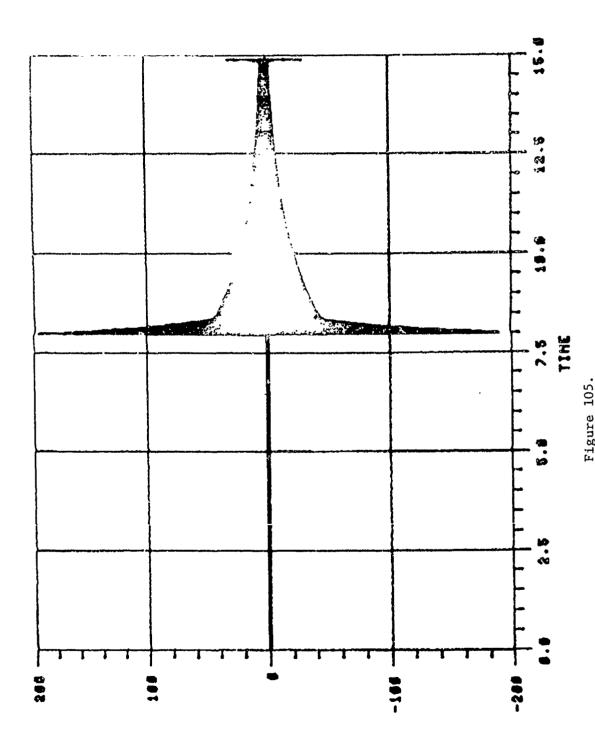
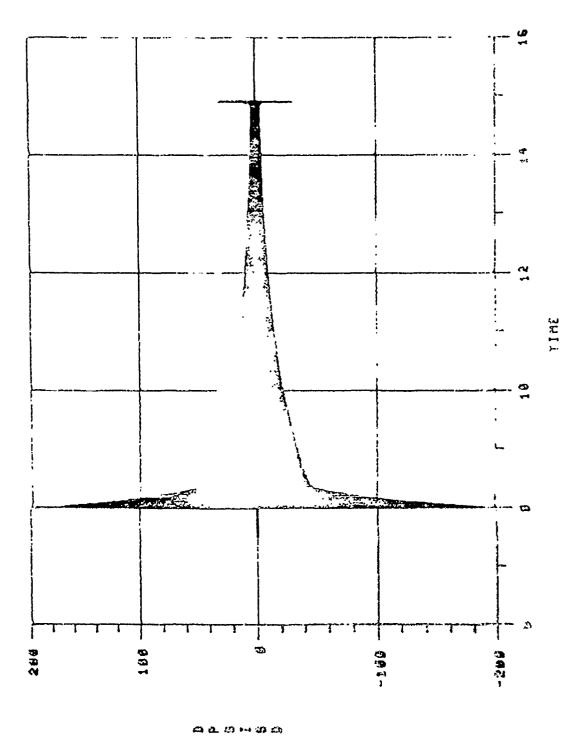


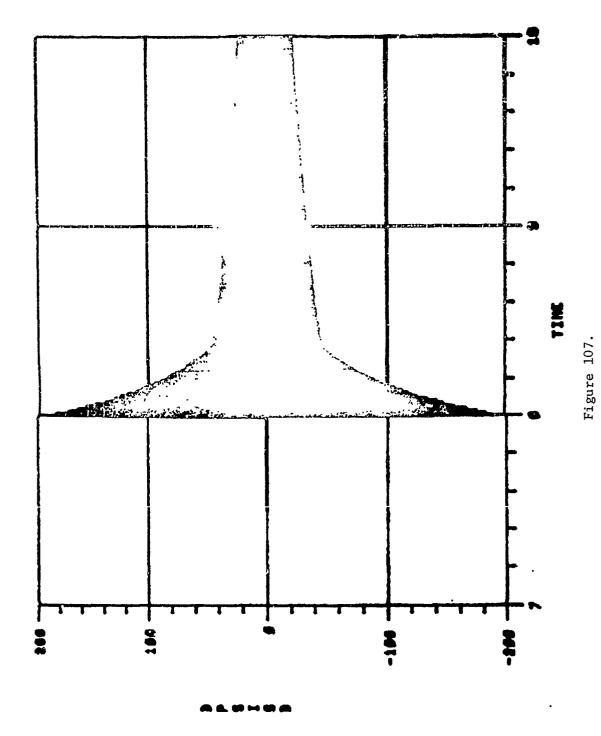
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Figure 106.



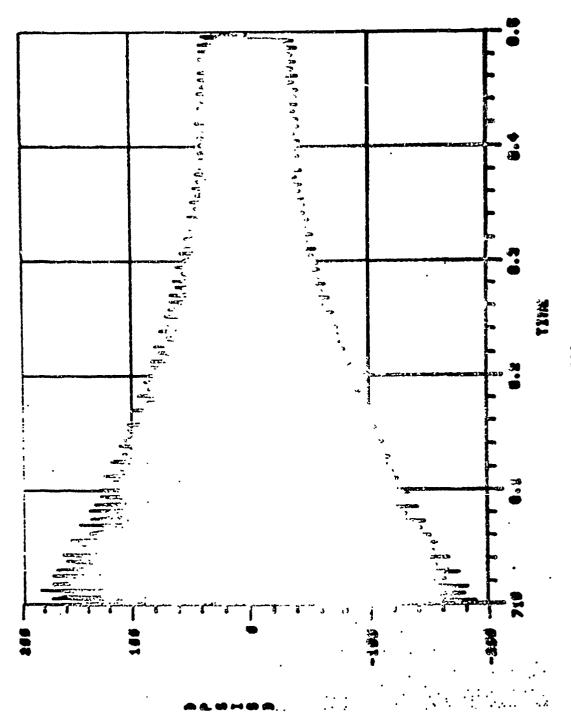


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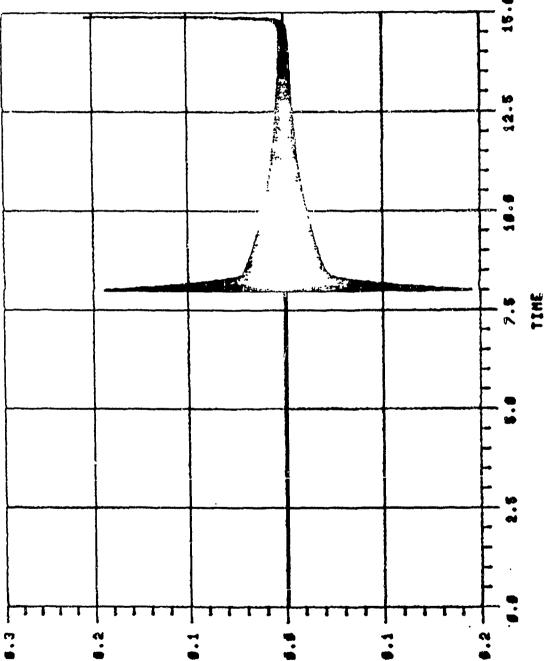


Figure 109.

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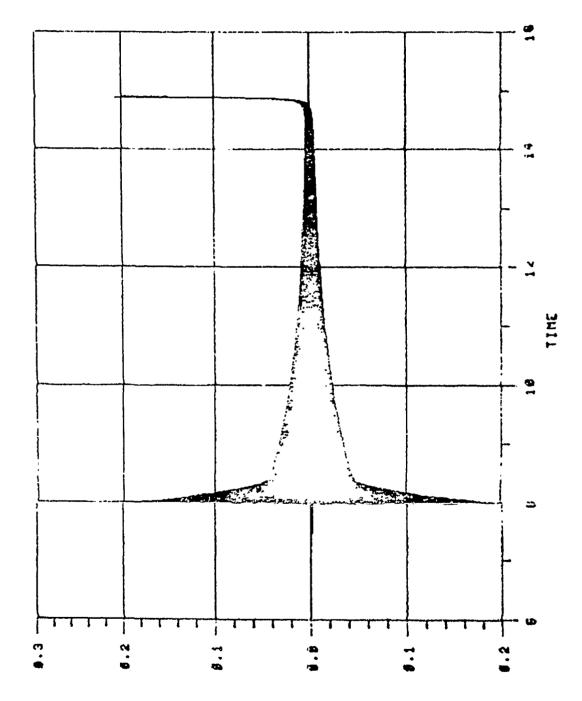


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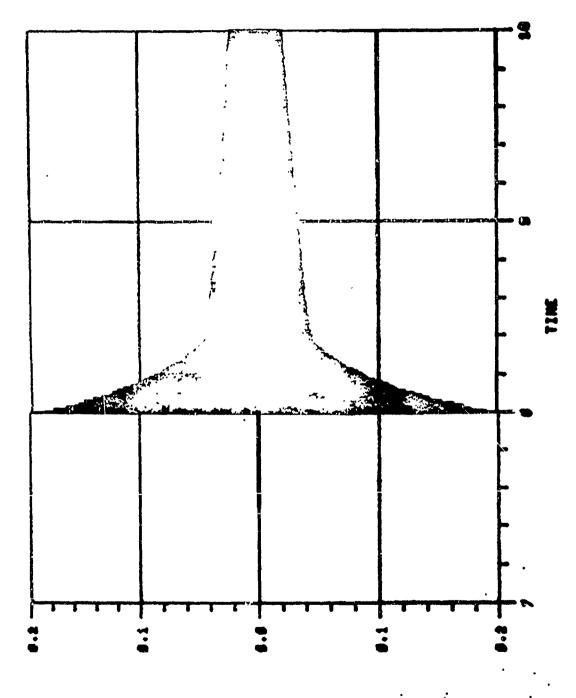
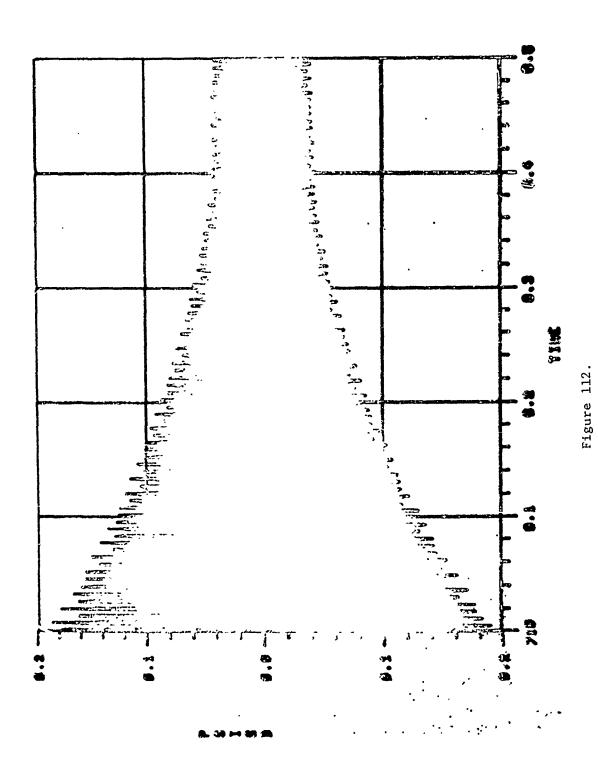
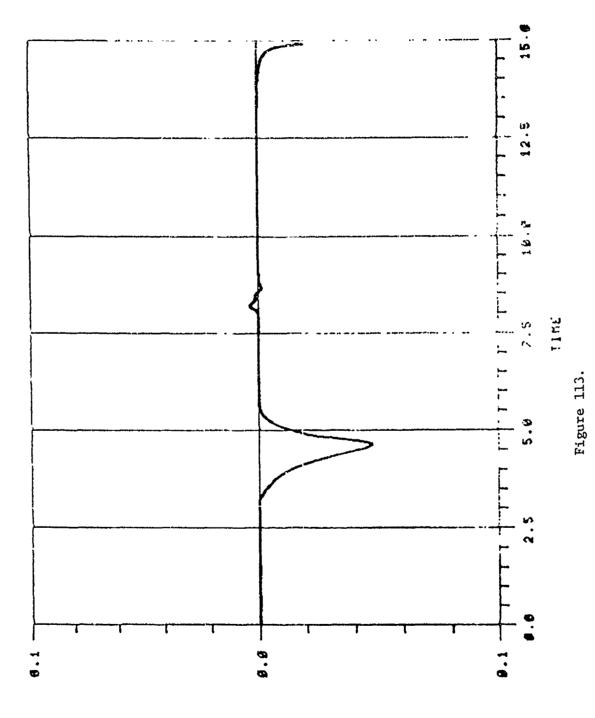
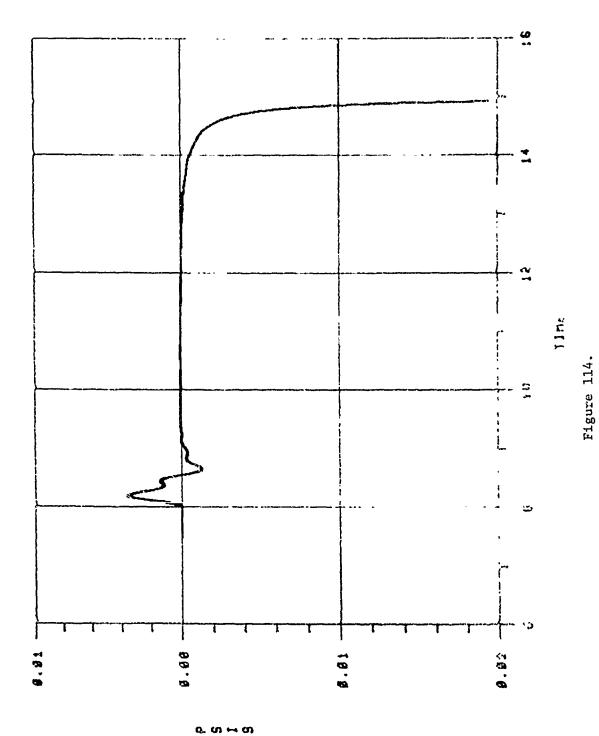


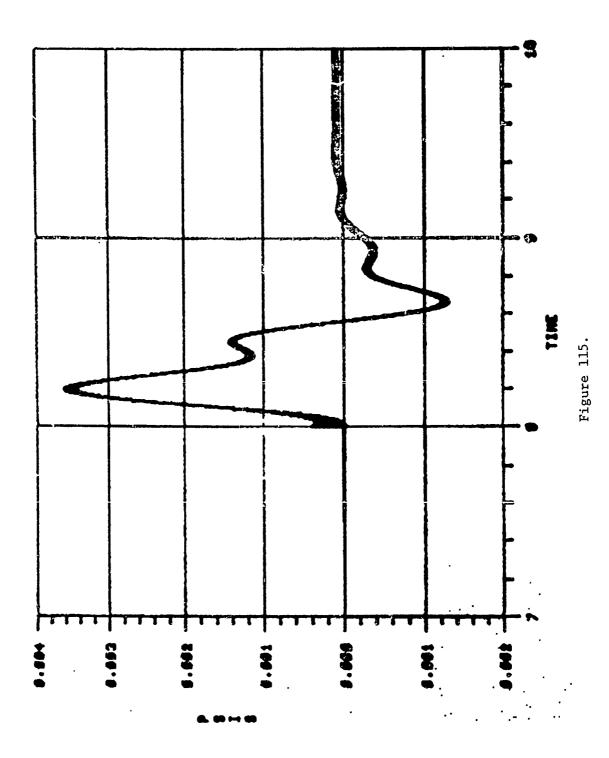
Figure 111.







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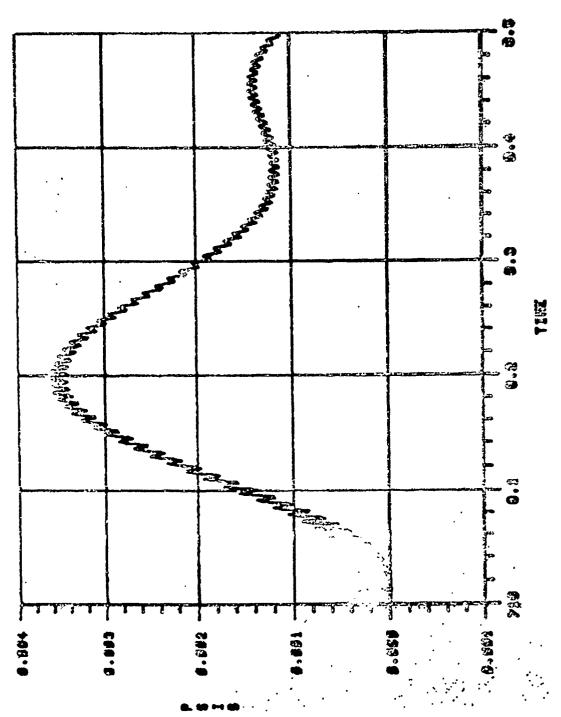
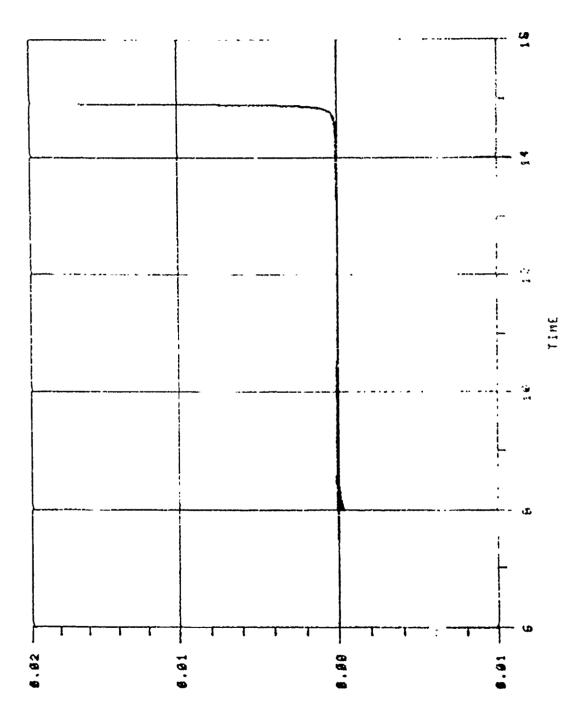


Figure 116.



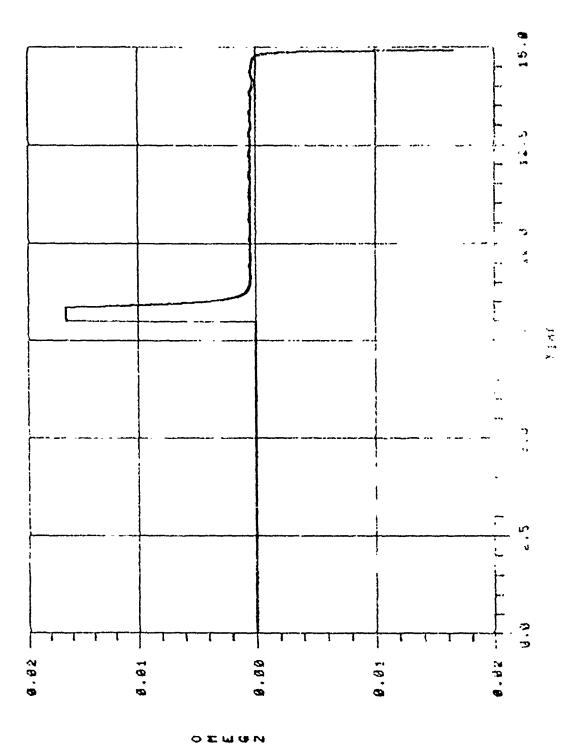


Figure 118.

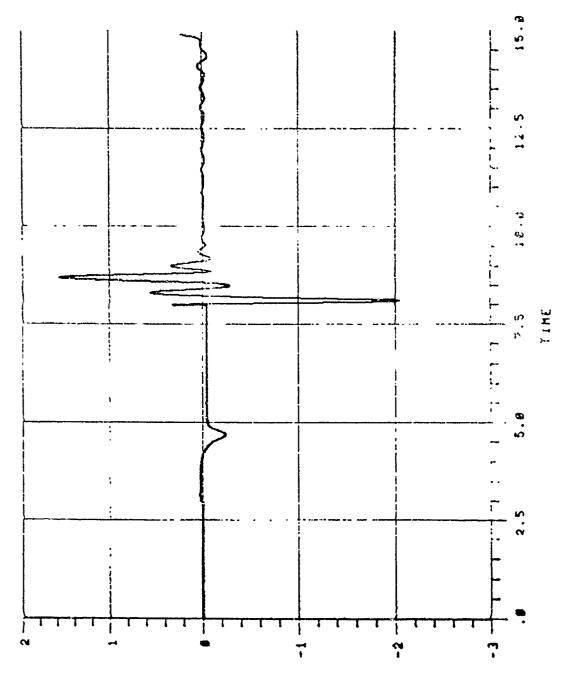


Figure 119.

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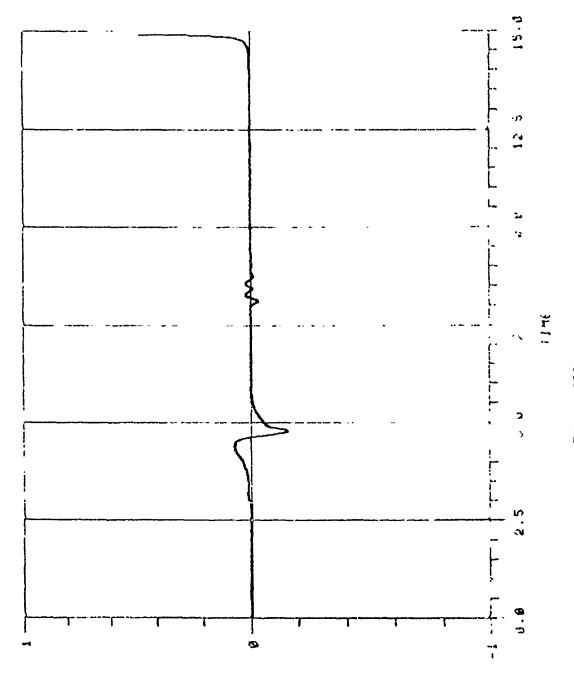


Figure 120.

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- 1. Greenwood, Donald T., <u>Principle of Dynamics</u>, Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1965.
- 2. Pastrick, H. L. and Hollman, H. C., <u>Analysis and Digital Simulation Models for CLGP: Martin Marietta Aerospace Design</u>, US Army Missile Command, Redstone Arsenal, Alabama, 35809, December 1974, Report No. RG-75-29.
- 3. Ogata, K., Modern Control Engineering, Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1970.
- 4. Pastrick, H. L. and York, R. J., Analysis and Digital Simulation Models for CLGP: Texas Instrument, Inc., Design. US Army Missile Command, Redstone Arsenal, Alabama, 35809, February 1973, Report No. RG-73-5.
- 5. Series Kearfott Technical Information for the Engineers, No. 2, Gyros, Platforms, Accelerometers, Seventh Edition, General Precision System, Inc., Wayne, New Jersey, 1967.
- 6. DelToro, V. and Parker, S. R., <u>Principles of Control System Engineering</u>, New York, New York: McGraw-Hill, Inc., 1960.

## Appendix A.

6-DOF DIGITAL MISSILE TRAJECTORY SIMULATION WITH AN IDEAL GYROSCOPE MODEL

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GITAL MISSILE TRAUFCIARY SIMULATIAN WITH AN IDEAL GYRASCAPE MADEL	E)X6), (FBRMAT, C), (FS12E, 1950), SAVE	
TRAUFCIARY SIMULATION W	,C),(FS12E,1950),SAVE	
GOFFICIGITAL MISSILE	IT (FILES X6), (FBRMAT	<b>W</b>
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COLUMN PRECISION OT/FSTRAM, SPER/TME/TMED/TMED/TMED/TMES/TMES/
                                                       ITIVE4, TET, DYA, TIVE
                                                         REAL KPC/KC/KC/KT/KT10/KT20
                                                         REAL KT30
                                                        REAL KTBU

REAL KE,KEL,KP

REAL KG,KEGL,KG,(AMPR,LAMPR,LAMB)

REAL LP,KC,KS,KA,KS,KR

REAL MACM,MASS,IX,IYI,IA
                                                                                                                                                                                                                                                    WILL
                                                                                      X8413317 X881431
                                                         COMPON/INTEG/KUTTA, VX, DTRK, U, V, >, P, Q, R, PHI, THYA, PSI, X, Y, Z, RTHTA,
17
                                                     COMPONITE TRANSCIPSIS, PSIS, PSISC, SMEGA, TXFD, PXFD, PEF, DELI, CELVP, 1RPSI, THTAS, THASC, PSIS, PSISC, SMEGA, TXFD, PXFD, PEF, DELI, CELVP, CREL3, CDEL1, CPLVP, CREL3, CDEL1, CPLVP, CREL3, CDEL3, CDEL1, CDEL7, CDEL7
11
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16
                                                         COMMAN/818/9511,8512,8513,8521,8522,8523,8531,8932,8533
                                                        COMMON/TOG/CP91/SPS1/SPH1/CPH1
COMMON/ IN/ GAMP, GAMY, DELYTH, DELYTH, DELZTR
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                                                          COMMON/RTV/DELXV, DELYV, DELZV
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                                                         COMPANISTUFF/ DELXS, DELYS, DELZS
COMPANINPSKR/PITERR, YAMERR
                                                         COMMAN/MACL/MACH, VSVC, UR, VR, VR, VRS, VRW, VA
                                                         COMPANIF/WX4, MYS, WZS
85
                                                         COMMON/COEF/CAZ,CY,CN,CLP,CMCG,CYCG,CLD,CMG,CNR,ALPHA,BETA,GMAD,
27
                                                       TOURS OF
                                                         COMMON/TODER/AXB, AYB, AZB, CLB, CNB, ALB, AMB, ANB, CMB
24
30
                                                         C3PMBN/CD/DEL VY, CEL VR, DELR, CELROL
COMMON/JUNK/TIME, TIME3, RHO, B.D. SQUW, CAP, TRAP, RAPTM1, RAPTM2, [ACT,
31
                                                      1SLUPF1, PT1, RAPTM3, SLOPEZ, BTZ, CTT, CPT, SPT, XLTA, STT, QAPS, QAPSU,
                                                      2CARSCM. TH
32
                                                         COMMON/PP/PFCLO;FFCMB;FFCNB;FFAXB;FFAYB;FFAZB;FFALO;PFAMB;PFANB
33
                                                         COPMAN/GG/Gxe, GVB, GZB
34
35
                                                      COMPANJUSKI/THRED; IRCLL/G, MASS, IX, IYZ, XIKTIA, NAVY
COMPAN/MO/GERALT, TO, TGRAD, RHOSL/ARG1, MTHRE, RSTAR,
IRMRE, ARUZ, GR, TMPL
36
37
                                                         COMMAN/TT/FSTSAM,TIME4,DT,DTA,TST,TME;SPE9,TSAM,D0,JMAX,IPRINT,T2
COMMAN/JUWARZ/SRKGE;IPUP9;IACG;RDET;YAWERS;P17ERR;PHFOV;BA;RAGEIN;
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                                                      171TYANSG, RED, NULSKA, BRS, RFLECT, NULL, KAGE
40
                                                         COMPAY/EDH/RSL,KT,KT10,KT20,LAMPR,LAPYR,RTH,RTHIN,RSGE,ED1,FLG4,
                                                      185A,FD4,QSA
COMMON/PERV/OMEGY, 64EGZ
42
47
                                                         COMMINIAD/YEG, RES, PEG
..
                                                          <del>CO~PPN/ARRON/PN101FL617FL62,FL63;REF;RFL;YE0;PE01</del>TH<del>R88;P9R86;</del>
                                                      17-95,P585,G9LV,PFFL,RPD,KG,KM,K6.LAMBI,P8LES
COMMAY99/51,92,53,54,55,56
COMMAY99/81,92,53,54,55,56
46
47
  1.
                                                         COMMSh/STUFF1/DELX8, DELY8, DELZ8
   3 =
$ u
K o
                                                         ********
                                       C
   40
                                                         AERO
   7•
                                                         ALPHA
   4.
7**
                                                         CAC
110
                                       ccc
174
                                                         AUTOPLT
```

```
TEALLT VALLES
# °
K 4
                  REAL PEAL 2761/
                 142.4966701776+01,+5.1868870006+02,+3.21747497708+01,
                                                                             001--003
52
                 3+4.971992513E+04,+5.312000000E+00,+4.48864000E+00,
4+2.01000000E=01,+5.723000000E+00,+5.08300000E+01,
                                                                              004--006
52
                                                                              007--009
24
                                                                              010--012
5=
                 <del>013vv</del>015
55
57
                 6+C.OCCOCCCCTF+0C,+0.00CCCCCCCCC+Cc,+0.00CCCCCAC+CC,
                                                                              016--018
                 019--021
4
4 q
                                                                              025--027
6'
                 4+2.500000000E+02,+2.50000000000E+01,+2.0000000000E+00,
                                                                              028--030
61
                                                                              <del>0314403</del>9
                 87
63
                 r+c.orcooccong+or,+5.cooooccoce+c1,+1,500oncocce+01,
                                                                              034--036
                                                                              037++039
                 7+1.00000000000£+00.+1.00000000000£+00.+1.000000000£+00.
                 F+1.000000000E+003-1.000000000000+003+1.000000000E+003
F+1.000000000E+003+1.00000000000+003+1.000000000E+003
                                                                              040--042
6 R
                                                                              043--045
64
                 G+1.005UUCCODE+0C,+8.0000000CCE+00,+1.50000000CE+01,
                                                                              046--048
                   044++054
69
70
                 1+5.00000000E-02,+2.352K00000E-03,+1.622600000F-05,
                                                                              052++054
                                                                              095++057
                 058--060
71
                                                                              041--063
72
                                                                              064+-066
                  -1.000000000E+C1,+6.0000C0000E+C0,+3.140000000E+O2,
73
72
                  1147-4169
                                                                              070--072
5 %
26
                 *+C.0C0000009E+C0,+0.000009030E+00,+0.00C000000E+00,
                                                                              073++075
                 -- C. CO0000000E -CO, -0.000000000E -O0, -E. 830000000E -O1,
                 G+C.000000007E+CG.+0.000C070C0E+OG.+0.00000CCCCE+OC.
                                                                              C76--078
77
78
                  9-4.000000000E+03.+0.000000000E+00.+0.00000000E+00.
                                                                              079--081
79
                 5+C.000000000F+00,+0.00000000000E+00,+0.000000000E+00,
                                                                              0820-084
                  085--087
81
                 U+C.000CC0C07E+0C,+0.0000CC070E+0D,+0.00000007E+0O,
                                                                              088--C90
81
                 v+0.00000000g*+co,+c+000000000g+00;+0.00000000E+00;
                                                                              091++093
32
                 %+C.00C070C07E+00,+0.000000000E+C0,+0.00000CC00E+00,
83
                 097++099
84
                  Y+C.COCOCCOTE+CO,+2.1.2244847E+C2,+5.251000000E+02,
                                                                              100 -- 102
85
                 Z+8+726690009E-03++1+0000000000E+0C++0C+0+000000000000
                                                                              1030-105
8
                 1+C.COCOOCCOTE+OO,+O.OOCCOTOTE+OC.+C.OOCOOCCOTE+OO,
2+C.COCOOCCOTE+OO.+O.OOCOOCTOOF+OO,+O.OOCOOCCOTE+OO,
                                                                              104--108
87
                                                                              109--111
2 2
                 3+C.CCCCCCCPE+00,+0.0000CCCTCE+00,+0.00CCTCCCCE+00,
                                                                              112--114
80
                  115--117
91
                 #+C.50000000nE+C0,+0.00000nCngE+3C,+0.0000nC300E+0C,
                                                                              118--120
91
                  #<del>*****************************</del>
                                                                              121**122
97
                 5+C.-C3000001E+C3.+0.0000030101E+C3.+0.000010001E+C5.5+C.-000010001E+03.+0.000010001E+03.+0.000010001E+03.
                                                                              123--125
97
                                                                              126--128
94
                  F+C.CCCCCCCGF+00.+0.00000c0n0E+00.+C.000naccocE+00.
                                                                              129 -- 131
9*
                 4+C.000000007E+00,+0.00000000000E+00.00000000000E+00
                                                                              132--134
96
97
                 5+C.00CC0CCOF+CC.+C.C00000000CE+CC.+C.000000CC0CE+OC.
                                                                              135--137
                 1-24--140
                 #+C.000000007E+C0,+C.0000000000E+OC,+C.000000000E+OC,
                                                                              141--143
99
                 144--146
                  5+C.90000000F+00,+C.0000000000E+90,+2.0000
                                                                              147--149
                                                         12058+004
                 #+C.9000000707E+00,+0.000009070E+00,+0.000070007E+00,
                                                                              150--152
                 5+C.00C0CCC0;E+CC.+C.00C0C0C0C0C0+O.00C0C0C0C0C0+OC.
                                                                              153 -- 155
                 456--458
• • •
                 #+C.nnnonocore+oc,+o.onoco.nnoce+oc,+o.onococonce+oc,
#+C.nnnonocore+oc,+o.onococonce+oo,
                                                                              159 -- 161
. . .
                                                                              162--164
                 165==167
                                                                              168--170
```

```
##C.000000007#+00, #0.000000000000#+00, #0.0000000#+00,
##C.00000000#+00, #0.00000000#+00, #0.0000000#+00,
#+6.60800000#+04, #0.000000000#+00, #+.00000000#+04,
110
111
                                                                                                                                                                                                                                                             178--180
                                                          180==182
                                                         5+0.cn000ccare+cu.+0.30000n370E+cc.+0.000300370E+cc.
*+0.00000ccare+oc.+0.3000nn370E+cc.+0.30300con2E+nc.
117
                                                                                                                                                                                                                                                             183 -- 185
114
                                                                                                                                                                                                                                                             186--188
                                                         #+C+C00000CC9E+CC++0+000000990E+C0++0+979390000E+CC+
                                                                                                                                                                                                                                                             189--191
116
                                                                                                                                                                                                                                                             192--194
                                                          *+C.COCCCOTE+CC.+8.COCCCT+CR.+6.COCCTCCT+CO.
                                                                                                                                                                                                                                                             196--198
                                                         5+8.300000000F+07.+6.5000000000F+003.+1.020070000E+017
                                                                                                                                                                                                                                                             19944201
                                                          5+1.440000000;+01,-4.0000070700E+03,+1.000000000E+03,
4+0.00000007F+00,+0.000007070E+00/
119
                                                                                                                                                                                                                                                             20200204
                                                                                                                                                                                                                                                             205--206
     1 .
                                                            COLPLE PRECISION DOUBLE (COL)
121
                                                          1+0.00000000000+00/
122
153
                                                             INTEGER FIXED (030)
                                                          1*C00CC001*,*300C00000;*C00000002;*U0C000000;*6000000128;
1+C00CC00256;+CCC0C00001;*C00000002;*000000000,*0000000000;
マフェ
                                                                                                                                                                                                                                                            001-4005
128
                                                                                                                                                                                                                                                             006--210
126
                                                          011--015
                                                                                                                                                                                                                                                             016--020
127
                                                           121
                                                          021--085
179
                                                          026 - - 030
                                                             LGGTCAL GATETOCTTTSETYSTRUESTARSTYSFALSEST
130
                                                            LOGICAL LOGICAL (008)/
131
                                                          1.TGLE ...FALSE...FALSE...FALSE...FALSE...FALSE...FALSE...FALSE...FALSE...
133
134
                                                           ARLAMP, RPMIG, ROET, LAMBI, BF, KO, TIMFO, TIME1, TIME2, TIME3, TIME4, ZMIN;
                                                         AMLAMINAMINISTELMINISTIANIAS AMENINISTA NESTINES ANTINES ANTIN
135
136
137
138
139
                                                          F, RTPL, S1, S2, S3, S4, S5, ISKR, IRALLOC, IACT, IACC, IRRINT, JMAX, IRAP,
                                                         TTHETAT, PSIT, SLOPET, SLOPEZ, BYT, BTP, XLTA, RADTHI, RAPTHZ, RAPTHZ
H, TA, TC, TC1, TC2, TC3, TO4, TO3, TO6, TO7, T1, T2, NULL, I FUF5, I GUIDE, T1P1,
UT1P5, KP7) KM, KC, THTBU, CTRK, S5, S7, S8, S9, S11, S12, KT, KT10, KT20
K, SFC, SF1, SF2, SF3, SF4, SF5, KF6, SF7, SF8, SF9, SF10, SF11, SF12, SF13, SF14,
LSF15, RTM IA, KAGE, FFCLB, FFC+B, FFC+B, FFAXB, FYAXB, FYAXB, FYAXB, FYAXB, FYAXB, 
141
187
143
                                                          MFFANB, FULL, THALD, NAVY, KT30, KC
REAL MDAC(16)/16+0./, PBLER(21)/
146
                                                          1+2.00000005+01/
                                                             togicku-fugcyviatesvyfuglyviatesvyfuge/viates-yyfugg/viates/v
149
                                                          SFALSF./,FLGA/.TRLE./,IMPACT,ERROR,FLG5
                                                            150
151
152
                                                             CATA 91,52,53,54,95,86,57,58,59,510,511,512/-1+,1,,3+-1+,7+1+/
153
                                                             CATA SUPPEL-SUPPEZ/36-7346938,-11-53846154/-4LTA/1-666667/
                                                             CATA-RAPTM139APTM239APTM3/13636493134/
754
                                                             CATA R2C/5+729577951E+01/, D2R/+C1745329/
155
                                                             CATA RBJARJM, 4, 8/20+00017192, +0921878; +C0008418.+00009972/
. 44
                                                             CALL AUPRISCI (99995,1)
                                                                                                                                                                                                                                                                   HH1074
                                                             CALL EDFSET (99985, LUNIT)
157
154
                                                       1 CONTINUE
                                                                 <del>• [2 - + • | • [- 1 | 6</del> -
                                                             CALL MODE(191)
16^
161
                                                             C9 1234 1+0,150CG
162
                                                              CALL HDACS(D)16/ACAC)
161
                                           1234
                                                             CONTINUE
164
TEE
                                                   PAGS ACPRESSES AND INITIALIZE LIBRARY PLNGE-KUTTA INTEGRATOR
166
                                           C
167
                                                                CALL RUNGKIIDL, U, CT, TIME, X.A., X.B., NX, DERIVS?
163
```

```
INDUT VALLES
170
                  ç
                          GATE(CC1) = RST1 GATE(CC2) = RST1 GATE(CC3) = RST1 GATE(CC4) = HST-------
TGATE(CCC5) = RST1 GATE(CC6) = HST1 GATE(CC7) = RST
172
777
                          TIME
174
                                     • 15UBLF(011)
                                     # FIXED(001)1 NUM
# FIXED(003)) NPPS
17×
                                                                  * FIXED(OC2)
                          IPRINT
176
                                                                  * FIXED(004)
177
                           KOT
                                      . FIXED(005)) NOTA
                                                                  . FIXED(006)
                                                                                                             ------
                          KAGE
                                      . FIXEC (007) | NULSKR
                                                                   * FIXED(ODA)
                                                                                                             ......
                          XXVY
124
                                     A LIKECTUDALL IGALLA
                                                                  * FIXECTOTOT
                                                                                                             ******
                                     * FIXED(011); IRALL * FIXED(013); IRAP
                          IFLES
                                                                  . FIXED(012)
185
181
                          ISKR
                                                                                                             ******
                                                                   . FIXEDIGIAS
182
                           IACT
                                     * FIXED(015); TRALLOC
                                                                  . FIXED(016)
                                                                                                             ******
                                     • FIXED(017); NULL
• FIXED(019); 100M
187
                          TACG
                                                                  . FIXED(015)
                                                                   . FIXEDIOSCI
184
                          KAGE
                          ICL"
                                      A.AIXECIOSIII.
                                                       אניסוד.
784
                                                                   * FIXEDIDALL
                                     • FIXEC(023)1 100#
• FIXEC(025)1 100#
• FIXEC(027)1 100#
186
                                                                  . FIXED(074)
                                                                                                             ------
                          ICL
                                                                                                             ------
                                                                  . FIXEDIOPA)
                          ICLP
                                                                                                             ------
158
                                                                  . FIXED(028)
149
                           ۳رن۵۱
                                      4 EIXED(029)1 10UM
                                                                  . FIXEDIDAD)
                                                                                                             ******
150
                          FLGS
                                      * LOGICAL(GO1); IMPACT * LOGICAL(002)
191
                          EREPK
                                     A_CGGICYC.COGGI
                          FIFFE
                                     PEAL(CO1); TT
192
                                                                 . REAL (002)
193
                          GO
                                                                 # REAL (OCA)
194
195
196
                                      * REAL(005)) RHSEL
* REAL(007)) CG
                                                                 # REAL (DOA)
                          58
                          MASS
                                      . REALICO911 1X
                                                                 . REAL (OSC)
797
                           177
                                        TEXUTOTATION OF
                                                                 * REXCTOSES
                                        REALIGIBLE RE
                          RELECT
                                                                 . REAL (014)
...
                                                                 # REAL (016)
# REAL (018)
199
                           4459
200
                          FSTSAM
                                      . DBLE (REAL (017)); BRS
201
202
203
204
                                     * REAL(C19); LAPRI
* REAL(C21); KG
                                                                 # REAL (DZC)
                          CELRAL
                           ۷٤
                                                                 . REAL (022)
                          ***
                                        REALTO2317-KROU
                                                                   PEAL IOSA
                                      4 REALIGES); RVBIAS
                          PC
                                                                 . REAL (026)
201
205
207
                          Q F
                                     • REAL (027) | 59
• REAL (029) | 895
                                                                 # REAL (025)
                           1 F
                          PHIMAX
                                      * REALICETTE ATOL
                                                                 # REAL (032)
200
                          AP
                                      . REALICES) 1 CS
                                                                 # REAL (034)
ماك
                          -X4-
                                        PERLICISTI OC
                                                                 # REAL (098)
                                      * REAL (037); FECUB
* REAL (039); FECNS
210
                          KGL
FFC=B
211
                                      + REAL(041); FFAYB
+ REAL(043); FFALB
                          FFAXE
                                                                 # REAL TOART
212
213
                          FFAZR
                                                                    REAL 10441
714
                          FFAMO
                                      . REAL (045) | FFA'B
                                                                 . REAL (046)
                                     TEAL (047) THIAC
                                                                 ---<del>9541-104</del>21
                          -6+W1-#
                           ŸCL
                                                                 . REAL (050)
214
                                                                 - REAL (052)
                          3F
                                      . REALICETII CLD
                          T.A.
                                      4 9FAL(053)1 IT
214
                                                                 . REAL (05A)
                          KC
                                      . REAL (055); RNGLI
219
220
                          PHERV
                                        REAL (057) J YHFOV
                                                                 # REAL (05%)
72:
                       - nemy
                                     REAL TOBOT
                                     . 9FAL (C61)) K4
                                                                 . REAL (062)
                          VHATE
222
                                      . PEAL (063) | FAGN
                          K5
                                                                 . REAL (C64)
227
                                                                 # REAL (06A)
                                      * REALIGABLE BMEGA
* REALIGABLE U
٠,٠
                          PCA
 . 7 6
                                      * REAL(069); #
                                                                 # RE4L (070)
                          ٧
224
-27
                                        -9E4L-107171-0
                                                                    REAL-(0721
                          5
                                      . RFAL (^73) | PSI
                                                                 9 REAL (074)
226
יבי
                           THIA
                                      . PEAL(C75); PHI
                                                                 # REAL (074)
                                      + RF4L(C771) Y
7 PEAL(C79); PSIS
; ; ;
                                                                 # REAL (074)
                                                                 * REAL (050)
```

- M

```
REAL(091)) DP
REAL(083)) DP
REAL(085)) DV
                                                                . REAL (082)
                          rc
47E
                          ٩Ļ
                                                                  REAL (DAK)
                                     # 9FAL(^49); 0FLXB
                          5x
5el ye
7el ys
                                                               TERLIDER
234
                                                                  PEAL (090)
                                       REAL(1911) DELYS
                                                                  REAL (032)
237
238
                          rei Ze
                                                                . REAL (094)
                          YA . FRR
                                       PEAL(095)) PITERS
                                                                  REA: (096)
                                                                                                          ......
                                       #FAL(097); 6"ESY
                          YALERS
                                                                ■ REA. (299)
                                                                                                           ------
                         -AFEGT
741
                                                                  REALISTON
                                                                  REAL (104)
                          211
                                       9FAL(101)1 9T2
242
                          THÝBL
                                       PFAL(10311 KC
243
                          SFC
244
                                       RFAL(105)1 SF1
                                                                  RE4L (106)
                                                                                                           ------
745
                          582
                                       REAL(107)) SE3
                                                                  REAL (108)
                          CF &
                                       FEAL(109)1 SF5
                                                                A SEVETTIST
246
                          SF F
                                       MEAL(STTS) SF7
787
248
                          SFR
                                                                # REAL (114)
249
                          SF1C
                                       9EAL(115) | SF11
                                                                # REAL (116)
                                                                                                           ------
250
                          SF12
                                       9E4L(117)) 5513
                                                                  REAL (118)
                                                                                                           ------
                          SF1*
                                       RFAL(119)1 SF15
251
                                                                  REAL (120)
                                                                                                           ----
                                       TOIT ((151)) TICE
                                                                  REAL (122)
252
                                                                                                           -----
754
254
                          চমধৰ
                                       PEALITESTTUKSP
                                                                  PEALITZAT
                                                                .
                          CSA
PEG
                                       REAL(125)1 RSA
                                                                  REAL (126)
                                     * REALISTII YEG
255
                                                                # REAL (128)
254
                          REG
                                       PEAL(129); RET
                                                                . REAL(130)
                                       REAL(131); RED
REAL(133); DELYV
                          REN
                                                                  REAL (1921
257
25
                          12
                                                                . REAL (134)
                          <del>6567</del>7
                                       9EXET: 3517 "OFER
                                                                  REAUTIONS
26C
                          CELI
                                       REALISTIS DELS
                                                                 REAL (136)
                                                                 REAL (142)
261
                          CELVP
                                       PFAL(139): DELA
PFAL(141): DFLMIC
263
                                       PEAL (1431) THB9
                                                                  REAL (144)
                          PSPS
264
                                       PEAL(185) THRBS
                                                                  REAL (146)
                          P3989
                                       REALIS - 711 - 747 40
                                                               - 9841(145)
285
                                       REAL(149); PEF
REAL(151); TXED
                          REF
266
                          4 E F
                                                                  REAL (152)
267
268
                          PXFC
                                       REAL(153); F1
                                                                 REAL (154)
                          FE
269
                                       9EAL(155); F3
                                                                 REAL (156)
                          P5150
                                                               # REAL (158)
# REAL (160)
# REAL (162)
                                       PEAL(157)) THASE
27^
                                       REAL(161)1 DOEL3
                          CRTHTA
271
277
                          CCELI
973
                          COFLES
                                       REALISTA CHELPS
                                                                # REAL (164)
274
                          CCELVP
                                       REAL(165); DOELPO
                                                                 REAL (16A)
                                       REALISTIE DODELS
274
                          CCCELI
                                                                ■ 9EAL (168)
                          CCLEFE
                                       REAL(169)) CRLAMP
276
                                                                4 9EAL(170)
                                       REAL(173)1 RLAMP
                          CALAM
                                                                  4E12(172)
277
279
                          RLAMY
                                                                  REAL (174)
279
                          APL10
                                       REAL(175); RPS1
                                                                  RE4L (1761
                                       REAL(177)) XT

REAL(179); ZY

REAL(181); DTHTAG
280
                          RTLTA
                                                                . REAL (178)
281
                                                               # REAL(150)
                          CHEIC
282
                          <del>****</del>**
                                                                 78 AL (184)
583
                                       PEAULIASII PHIT
                         PEC
284
                                       PEAL(185) | YED
                                                                0 REAL (186)
                                                               # REAL (198)
                                       REALISTIS DYES
284
                                       REAL(1891) PHIG
                          PEFL
284
                                       REAL(191); THTACK
                          CPHIO
                                                                 REAL (192)
787
                          VP
                          nco-10
                                       9EAL(1951)-T-8LD
7**
                                                                  PE46-11561
                                                               # REAL (198)
                                      9FAL(197); TIMEO
9FAL(199); TIMEO
9FAL(201); TIMEO
29^
                          SCET
                          TIMES
291
-92
                          TIMES
                                                                4 REAL (202)
                          2 1 1 4
                                     • PEAL(203); RTMIN
                                                                # 9E41 (204)
```

-

```
294
                              THASE TEAL(205); DUM
THASE TEAL(205); DP8157
                                                                          # REAL (204)
29=
191
                           TALCULATED VALUES
797
299
                              ARGI:1.+(GD+hTM9[])/(RGTAR#TGRAD)
299
                              XINTIA + (IYZ=1X)/IYZ
5*.25*PI+C**
202
30.
30.
                               -ALGOPIONS
                              CKZTKJAČÍKIZTKŮŠ-
304
304
303
                              CSWANG+CHS( VANG)
SPER+1+CC/DREE(FENAT(NPPS))
                              THE - CPER
3^4
3^7
                              DT+1+DO/DBLF(FLAAT (NOT))
                              CIRK . SNGL (DT)
300
                              TAMINOP/COLETELMATINOTATI

DEL MOLOMEAL (C191/M20

DEL MALOMEAL (M20

DEL MALOMEI/M20
ع ل و
310
311
312
                              PHIMAXEPHIMAX/RZC
317
                              GAMLR#GAMLB/RZC
314
314
                              ACERACENSSO...
                              PHENOPHENY/RED
316
                              VRATE PURATE /RZD
317
                              RVPIASORVBIAS/RZC
318
                              GC+GC/92D
319
                              PCL * PCL /RSD
                              THYACATHTACARSO
375
                             Cl*(|T*|A)/|T
351
323
                              RNGLIN RNGLIX /RZC
324
325
376
                              AKEANAAHEBA\BSD
                              K4.K4/R2D
                              THERTHINGE
727
                             CPSIS+CAS(PSIS)
321
                              SPANERRINT CONTROL. PRINTING OCCURS EVERY SPAN INTERVALS.
324
                              JFAX=1+CC/CT++000001
                              INPLT(105)
330
331
                              ZHALFOZ
337
                               ******
333
334
                              TC1#T0+.4;T02#TC1+.4
TC3#*02+-2
33ª
                              TC4+7C3++2
136
                              TGS#TG++2
337
                              TC6+TC5++2
33×.
                              TC74TC6W4E
134
140
                              T1#TC+2+
                             IF(T2+LT++01)TZ#T1+++
CIT+COS(THETAT)
SIT#SIN(THETAT)
141
342
343
                              CPT+CPS(PSIT)
                              SPYESINTESTY
788
                     IF(IRALLDC+FG+2)1ACT+2

C**** RANGE TAMBET PROM MISSILEHRTM IN FEET+

RIM+GCRT((XT+X)++2+(YT+Y)++2+(ZT+Z)++2*
345
346
347
                     C WHITE SANCS ALTITUCE +4000, FT.
COPPUP (MPORTANT DEPINE TIMEO -POR EACH TRAUFCTORY)
742
149
38~
                     Coose START ROLL GYRO (LINESSO) AT TIME:

Coose-CTART PITCH AND YAW GYROS(LINE 367)/ROLL CONTROL(LINE 399) AT TIMES

Coose FNAMLE TRACK AT TIMES IF TARGET IS YITMIN FOV AND ROLL
141
782
24.2
784
```

```
C++++ BAILISTIC FLYGUT

IFFRET-LT-5-1TIMF4#999-

ITFME-TIME+1-000001

C++++FIRST SCHEDULTO PRINT TIME

BRINTM-ITEMD
  755
  354
   ...
  ---
  350
 36^
                                                                             PELX.XT-X
 36:
                                                                             PELYOYTHY
                                                                             TELZOTTOZ
TELXTOELX
 362
 363
 181
                                                                             DELYTEDELY
                                                                             CELZT DFLZ
 365
 366
                                                                             CFD+C+
                                                                             CND#O.
 367
 36€
                                                       C....
                                                                           ECC+T1
 369
 37C
                                                                           EC1441+0452 ----
 371
                                                                             EC5++5
                                                                             E03+LC1++5
 372
                                                                             EC4.EC3+3.8
  774
                                                                             ECS+TIME3
                                                      DELMY-DELMX/RZD JDELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-DELMY-D
 375
                                                                                                                                                                                                    JDELMY#DFLMY/R#D
 376
 377
378
   374
                                                      90006 FORMAT(//2X, 'ULICANCE ENABLE')
90006 FORMAT(//2X, 'UNCAGE GYRE FOR ROLL TO VERYICAL')
90007 FORMAT(M1)
 380
  361
                                                                                                                                                                                                                                                                                                                          FLG+
382
 183
                                                       90010 FORMAT(/, 2%, 'BEGIN SEEKFR CANTI)
 784
 385
                                                                     9 CONTINUE
 386
                                                                                KUTTA T C
R E T U R N
 387
36#
                                                                                ENTRY DERIVATIVES
 389
 790
                                                       C
                                                                                KUTTA + KUTTA + 1
 391
                                                       C
 392
 393
                                                                             ALT . Z
                                                                            ALTHOR

GEALTHROSALT/(RASALT)

METO CALCULATES VOAD

CALL METO
 394
 395
 396
                                                       C ..
  198
                                                                   13 CONTINUE
 199
                                                                           -*CC
                                                                            CALL TRSFEB
 4C1
 402
                                                       C++ RCS TR SCS TRANSFORMATION, SEQUENCE IS THTAG+PS:8
CALL TR8F0S
1C0 IF(KLTTA+NE+1) OF TO 105
IF(TIME+LT+TH0LD)**NH+1
 +03
 4C4
 *OF
#0x
                                                                             IF(T1ME.GE.THOLO)YX+14
IF(GATE(OC3))G8 T# 1235
 407
 40
 403
                                                                              IFITIME . LT . TIME 3 1 GA TA 1235
                                                                             GATE (CC3) +5FT
 410
                                                                             Set/1991
 -11
                                                                             ~
                                                      -1-35-
 417
                                                                              IF (GATE (OC4)) 98 TT 1236
 413
                                                                             1F(T1ME+LT+T1ME1)05 T5 1236
GATE(CO4)4SFT
 +15
                                                                             IFEINT+2
 414
```

```
1936 CONTINUE

1F(GATE(CCS))GB TO 1237

1F(TIME+LT+TIME2)GB TO 1237

GATT(CCS)TOSET
419
421
421
                       IPRILY#2
                       CONTINUE
                       1F(CATE(OC6)) 00 TO 1238
1F(TIME+LT+YIME+) 00 TO 1248
424
425
                       GAVE (CC6) .SET
476
                       IPHICTES-
427
428
                1238 IF (GATE (OCT)) 98 TO 1239
                       IF (TIME . LT . T1 ) 00 TO 1239
429
                       SATE (COT) SET
437
431
                1739 CENTINUE
433
                       LOS FRRER IN SCS
434
                       CALL LOSERR
                       CLARRUTINE SPEK DETECTS TARGET BITHIN THE DEVECTION RANGE OF SEEKERS TARGET WITHIN THE FIELD OF VIEW, SOA-W, SEEKER WITHIN LINEAR RANGE
                TANGET WITH
CALL SEEK
TOR CONTINUE
C
437
I, JA
                C. MISSILF VELOCITY HAT AIR HASS
441
                      442
443
444 -----
                      HYS . HND&CSHANG
56E
446
              447
448
449
554
481
450
453
454
458
458
                C. . . CLARBUTINE DIFER CONSTRUCTS THE EGUATIONS OF MOTION
                      CALL DIFEG
                      442
                PHINT 90001; IPRINT +21FLGO ++NOT+FLGO
. 47
460
                      NX<sub>0</sub>33
467
                      SUBROLTINE ECSKROYRA CONSTRUCTS THE GEEKER GURD MODEL FOR ED
467
                CALL EDSKABYRA
464
٠,٨٩
464
467
                Č..
                      FC ALTOPILOT
                      CAUL EDAP
05 57 00
469
470
                C
471
                      FAGINEERING DESIGN AUTOPILOT
477
                5150 IF(TIME+LT+T £3)98 TO 401
477
                      374
                                                                                              FL-05--
475
                                                                                              FLG5
               6471 CONTINUE
+74
                                                                                              FLG5
477
                      STEGT #KS#YAHERO
```

```
CARROL TOFFICE . NILL ACCUINTIENTIACCOPPI
. .
                                AME ( VEK SO ( THITACOTHTAS)
                                TF(|ICG.EG42) HMFGY-KS+PITFR9

[F(APG(AMEGY),GT..10472) AMEGY-SIGN(.10472,BMFGY)

[F(APG(AMEGZ).GT..10472) AMEGZ-SIGN(.10472,BMFGZ)
282
ู้กว
LEAL GYRO
· na
                                 334003510040~550C+635348
476
                                 ....
٠,,,٦
                                 F3gnwEGZ#RSA
, no
                                 CPG106C05(PG15)
1F(104R-EG-1)F1+(AMPGY-PSA)/CP3I5
49^
. .
                                 IF(ISKR.EG+11F3+AMFGZ+05A
402
493
                                LAMPR . OMESY
171
495
                                 LAMYR & BMEGZ
494
                                 IF (TACG. NE . 2) LAMPR . LAMYROO.
497
                                      GYPO ECUATIONS FOLLOW
498
                        C
                                 DTHTABOF1
 299
                                 THARDEFE
: ক্র
                                 PPSISEF3
501
                                  SPSISDAFA
F03
                                  DOME GAOFS
 504
                        C... ROLL RATE GYRT
 K C K
                          #CT CONTINUE
1F (*imE+LT.*ImE1)05 TO *06
 <del>፻</del>፫ኝ
 FC7
                       IF (TIME+LT.FIME1)UT TO TUD

C+** ROLL GYRO EGS

TMP3 * SIN(GTHTA)

TMP8 * COS(RTHTA)

CRTHIA * (P*TMP4-R*TMP3)*TAN(RPS1)*G

CRMBITE #(F*TMP3+R*TMPB)

C***RATE CAMPING AF GIMBAL ANGLES

C IF (TIME+LT.TIME3)GN TO 301

IF (TIME+LT.TIME3)GN TO 301

CTYFCP=RO*(TYED+KG*THTAS)
 5C9
 =12
 513
 K 1 4
                                  CTXECP-PD+(TXED-KG+THTAS)
 ×16
                                  THRPS+BD+ (KO+THTAG+TXED)
 517
                       - - PPXECTVEDVKGVPS181
 ×18
                                  PSRES+BC+(KQ+PSIS-PXED)
 519
820
                                  THESEKROL THEBSOTHTAS
                       THUSERRULE HANDSETHTAS
PS95eKRGLEPGRRS-PS19
Cetage GAND ZONE FOR PS85, THBS
IF (ARG(THBS)-LE-GAMLE) GO TA 16C
THRE G KOLF(THBS=STOR(GAMLE) THBS)
GO TA 161
 621
 F 22
  253
  243
  524
                            16" THRSEC.
  E 2 6
                            161 [F(APS(PSSS).LE.GAMLB) 00 TA 162
PSPS * KOL*(PSBS-5]QN(GAMLB,PSBS))
00 TA 163
  527
  222
  729
                            167 PSPSECE ---
  ~7~
                             167 CHATINUE
  431
                         163 CONTINUE

C *** BLICANCE FILTER

C***KT AND LAMBI ARE TIME CONTRALLED CONSTANTS

164 CONTINUE

PENGLAMPROLAMPIONESTHTAS
                                                                                                                                         HILL
  £32
  433
  = 74
  c 3 e
                                   ALME JAUSA
  =34
                                   DPFF..BF*(PEF-KG+PED)
  637
                                   CYFF . BF . (YFF - KG+YED)
  438
                                   IF (APS(PEF) . GT . GC) PEF . SIGN(GC, PEF)
                                   IF (ARS (YEP) . GT . GC) YEF = SIGN (GC, YEF)
```

(SV

```
PEG#THRRS+THEG+PFF
541
                         YEG . PSRES . PSES . YFF
                         PEG = PEG

-IP regs(PEG)+G+PECU)PEG#51GM1PCU;PVG)-
...
ALT.
                         IF (ARS(YEG).GT.YCL)YEG-913N(YCL,YEG)
K4K
                  C+++RPLL DFCOUPLER
446
                         IF (TIME+LE-TIMES) OF TA 406
548
                         G0 T9(1401,1402), 189LLDC
549
                  1401 CONTINUE

[401 CONTINUE

C*****PREVIOUS ROLL DECTUPLER

IF [IACG.EG.2 *AND. TIME.GT.TIME* *AND. NULSKR.EG.2] GO TO 300
통증지
551
552
553
554
                         RLAPPETHTAS-RTHTA
                         GO TO 302
454
558
                         CRLAPYOLAPYR
557
                         CREAPPELAMPR
REA
559
                     302 CONTINUE
560
                         RICY -PSIS
461
                         RICPOTHTASORTHTA
                         RECURICPORLAPP
RENORICY-RLAMYORFS!
262
563
                     BOK CONTINUE
564
868
                          1F (RED-LT-+4363)RED++4343
                         IF (MED+0T+1+7453) REC#1+7453
RET#REN/RED
566
                          PHIOVEVARET
56*
                         GB TE 1404
569
570
                   14C2 CONTINUE
571
572
                  C. .... ATEST ROLL DECOUPLER
                         CRLAMY=ERS=(PS1S-RLAMY)
                         IF(IACG.EG.2)DRLAMY#0.
REX=SIMPSIWSZ#RUAMY#3#PRIS
REC#S#+TMTAS#SS#FTHTA
***
575
876
877
                          IF (ASSIRET) .LT.RTOLIGO TO 304
                  C. . . CHECK FOR SATURATION
                          IF(ARS(PMIMAX-ABS(RET)).LT.RTOL.AND.RED.LT.RFK/RET)GO TO 300
×7.
579
                     304-#ET#$10H193947#EH1-
38~
                          IF (REC. OT.O.) RETUREN/RED
581
587
                     304 CONTINUE
                          IF (APS(RET), GT.PHIPAX) RFT #51GN(PHIMAX, RET)
#À3
                          PHIGHRET
....
                    1404 CONTINUE
a g z
                         -CHPHIGO-BGORNHIGORGOIIY-BGYAF-JOFHIG
**
E 27
                          REF+(PG/AF)+PHIG+RPHIG
...
                          REFULKPOREF
                     IF(ABS(REF).GT..17453) REF#8IGN(.17483,REF)
3C3 CONTINUE
REG#REF#RV8IAS
489
E9^
591
=97
×91
                  CAR CANTRAL SYSTEM, CANARDS FOR EACH PLANE ON COMMON SHAFT
                        CONTINUE
304
                          IF(IACB-EG-2 -AND- NULSKR-EG-2) GO TA 226
c 9 c
E 9 6
                     SSI CAVITARE
                          YEG+O+
=97
                      --- PEGPCT
£ 63
                     276 CONTINUE
r d a
                          CALL CONTRL
400
                  C. + ATH ORDER RUNGE KUTTA INTEGRATION
401
                     406 CONTINUE
```

```
IFIKUTTA .NE. 11
4C3
                                              38 T4 40
  1.0
                       CALL BSVOTAPELIE, SKGL (TIME), CTHASD, THASD, TRS150, PS150, THTAS, PS151
404
                29
                       CONTINUE
¥05
606
                Č
                       PROCESS TIC MARKS ON CHANNELS O AND A
407
                C
40B
                       TICL . C.
                       IFITTHE . LT . DELECTIC ) 188 TH 1777
609
610
                ¢
                       SET EVENT LEVEL
                Č
612
613
                       IF (KAGE.EG.2) TICL .TICL +.1
                       IF(MULL.EG.2)TICL.TICL+.E
614
615
                       TICL . TICL + + 05
616
617
618
                c
                       SET ACGUISITION SIGN
619
620
                       IF (IACG.EG.2) TICL -TICL
451
                1777
                       CONTINUE
                       PHODATAN2(SIN(PHI), C88(PHI))
624
                c
                       PROCESS MOAC BUFFER
625
                       MCAC C1) #TICL/SFO
MCAC(C2) #(ALY #4000*)/SF1
                                                           #MDAC(09)=T1CL/SF8
#MDAC(10)=RP7+8MEQY/SF9
#MDAC(11)=RPC+PEFL/SF10
626
688
                       POAC(C3) STOTACC/SF2
                                                           IMDAC(11) #RPC=PEFL/SF10

IMDAC(13) #RPC=PEG/SF12

IMDAC(13) #RPC=THR89/3F13

IMCAC(14) #RPC=ORLAMY/SF16
689
                       PDAC(O4) WRED WTHTAS78F3
PDAC(O5) WRED WPS15/SF4
430
                       MOAC(06) #RED-CELROL/SF5
631
                       MGAC(07) #R2C+DELVY/9FA
633
                       POACTORY PREDEDEL VP/SF7
                                                           IMDAC(16) #RPC#THTA/SF15
634
635
                       TURTUR DACH TIMES
                c
635
                       00 1492 141,16
637
                       IF(ABS(MDAC(1))+6T+0+9999)MDAC(1)+81GH(+9499,MDAC(1))
638
633
                1492
                      CONTINUE
640
                       SUTPUT MOAC VALUES
641
                X
442
                       CALL MDACSIO, 16, PDAC;
643
644
                       IERR - ISVOTAPE (SNGL (TIME) . RZD+TXED)
645
                       PAKTAEXTUPHINTHOISEUS
                       IF(TIME.LT.PRNTYEXT.AND.IPRINT.EC.1168 TO 72
646
747
                       IPRILTO1
648
649
                    70 TFP1+8IN(PHI)
                       TPP2.COS(PHI)
650
                       PHOWATAME (THP1, THP2)
651
                652
633
                                           LIKE PRINTER
654
455
656
                IF (GATE (001)) 00 TO 1661
657
                       PRINT 90007
658
                       659
                      14HBF JAH
14HBG JAH
14HBRS JAH
                                                             , RTEL.
66C
                                    , BF
                                               .AHRTOL.AH
                                               JAHRA JAH
JAHKP JAH
JAHKQ JAH
                                                              BA
661
                                     ₽86
                                                              ,KP,
                                     BRE
642
                      14HBRS JAH
                                     J BRS
                                                              , KO,
443
```

* * 1	14HRT1 ,4H	BT1	,4HPT2 ,4H	,PT2	
664	14FCPT ,4H	CPT	AHSTY AH	STT	
66 <sup>K</sup>		•	, WHEFCH, WHB	FFCMB,	
666	14465 144	, C.S			
567	TANCEL VAN	TCTT	JAHRAPT, AHY3		
66 R	14FC , 4H	• D	,4HKG ,44	,KG,	
669	14PCEFW, 4HA	DELMY	AHEDO AH	,EDC	
670	14FC1 ,4H	JEC1	AHEDS AH	EDS ,	
£71	14HFD3 ,4H	∙E03	AKEDA AM	,ED4 ,	
672	14HED5 ,4H	≠E05	,4HKT10,4H	KT10	
-673	TAMPFALJAME	FFALE	TAHYCL JAH	TYCLT	-
674	14HFFAN, 4HB	FFANB	,4HGF ,4H	.GF.	
47¤	14HFFCL,4ME	FFCLB	, AHFFAZ, AHB	,FFAZB,	
£76	14HFFCN, 4HB	FECNB	, 4HFFAP, 4H8	,FFAMR,	
£77	14HGAML, 4HE	GAMLE	, AMBHES, AMV	, PHFAV,	
678	14HGC ,4H	GC	AHFFAX, 4HB	FFAXB,	
	TANTACTIAN	TACT	AHIRAL, AHEDE		-
679	14-10LM,4H	IDUM	1		
680	14H1FLF, 4H8	IFUF	4HNULL,4H	NULL	
681	• • •	IRALL	,4HKT20,4H	KTZO	
682	14H1R8L,4HL		4HS5 4H		
683	14H15KR,4H	ISKR		FBGV,	
684	14HIT #4H	, I T	,4HFBGN,4H		_
685	TAPIX JAH	71X	-,4H8D -,4H	7807	
686	14HTYZ JAH	JIYZ	,4HR2 ,4H	,R2	
687	14HK4 JAH	,K4	AHPCA AH	PCA,	
688	14HKE ,4H	, KB	, HRVBI, 4HAS	,RVBIAS,	
689	14HKC JAH	,KC	, AHTHTO, AHL	THTCL	
690	14HKGL J4H	, KGL	, 4HFFAY, 4HB	,FFAYA,	
691	THEKAD TAH	JKPC	J4HT1P5J4H	7175	_
492	14-KRGL, 4H	, KRGL	,4HAF ,4H	, AF,	
693	14HK8 /4H	JKS	) #HKW	, KM	
694	144646446	JLAMBI	44UMXX,4H	ه ۲۸۸ س	
695	14HMA59,4H	J MASS	) #HCG	, CG,	
696	14-LRLN.4H	<b>NRUN</b>	,		
-697	-14HPCL-y4H	- PCL	<del>~</del>	-1 tx7	
69*	14HPHIM, SHAX	ZAMIHA	,4HS8 ,4H	, 98	
699	14HBRTN:4HTM	PRINTM	エキャンマをってゅう	t XA™L t	
700	14HRAPT, 4HM2	,RAPTH2	, AHRAPT, AHM1	,RAPTM1 ,	
701	14HRDET JAH	ROET	JAHDTA JAH	,07A .	
702	14HRFLE, 4HCT	RFLECT	HPT JAH	,PI,	
703	- LAHRLAM, AHP-	JRLAMP			_
	14HRLAM, 4HY	ARLAMY	. AHRPSI.AH	RPSI	
704	14HRNGL, 4HIN	RNGLIN	#HVRAT OHE	, VRATE,	
70=	14HRTMI, 4HA	RTMIN	AHKM AH	KM	
706	•	37	14H56 14H	.56	
707	14457 /44	510	4HS9 4H	, S9	
70#	-14HS10 /4-	<del>-7912</del> -		7911 7	
709		,54°	4HS3 4H	,83	
710		,92	14HS1 14H	.91	
711	14452 ,44		AHDELM, AHX		
712	14HS ,4H	, S	14HSF1 14H		
713	14HSF0 /4H	#SF0	,4HSF3 ,4H		
714	14HSF2 ,4H	,SF2		, SF3 <del>-, S</del> F5	_
712	-1+HSF4-y4H	<del>-,3,4</del>			
716	14H6F6 /4H	,SF6	,4HSF7 ,4H	.SF7	
717	14HSF8 ,4H	,978	#HSF9 ##H	.SF9	
710	14HSF1C+4H	,SF10	,4HSF11,4H	,SF11	
719	1445F12##H	,5F12	,4H0F13,4H	,SF13	
720	14HSF14,4H	, SF 14	,4HSF15,4H	.SF15,	_
<del>-72]</del>	-14H3LAP>4HE2				-
722	14HTC1 #4H	,TC1	, 6HTO , 4H	,70	
723	14HT03 #4H	,TC3	HAL SOTHAL	, TO2	
724	14HT05 34H	,T05	,4HT04 ,4H	,T04	
725	14HT07 #4H	#TC7	34HT06 34H	, TO6 ,	
•					

P.A

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14HT2 J4H
14HTB J4H
                                                 ,4hT1 ,4h
                                       ,12
726
                                       ,TA
                                                  , 4hSPT , 4h
                                                                 SPT
727
                       1447486,440
                                       , THALD,
728
                                                 THKD THE
                       JHFTKYPHAT
                                       THYLE
729
                                                                 'KC'
                                                                 , IPAP
                       14MYHET, 4HAT
                                       THETAT
                                                 , 4HIRAP, 4H
730
731
                       14HTHOL,4HD
                                       , THELD
                                                                  .TICI.
732
                       14HTIC JAH
                                       TIC
                                                  144TIC] 144
                       14HTIPE, 4H3
                                       ,TIME3
                                                  CHALINE , 4HD
                                                                 ,TIMES
733
                                                  , AHTIME, 4HO
                                                                  TIME?
                       14HTIME, 4H1
                                       ITIME!
734
                                                 JAHKS JAH
                       THHTIFITHM
                                       TIPL
                                                                 TC
735
                       14HYHF8,4HV
                                       , YHFAV
                                                                 , K5,
736
                       14HZMIN,4H
                                       .ZMTN
                                                  JAHTIME JAHA
                                                                 ,TITEL
737
                       14HMNC8,4H
                                                  . HEMIN, 4H
                                                                  ZMIN
                                       , WNDS
738
                        GATE (001) #SET
735
                        CONTINUE
740
741
                        PRYNT-90007
                        PRINT 90000,4,4HPRAJ,4HECTI,4HLE:
742
                                                                 , RSA
743
                       1427175/87
                                       TIME
                                                  , AHRSA , 4H
                                                  , LHU
                                                         34H
                                                                 , U
                       14HDELV, 4HP
                                       .DELVP
744
                              , 4H
                                                  AHE
                                                         , 4 H
                       14HV
                                       , ٧
                                                                  . W
745
                                       ATHTA
                                                  LHPHP 14H
                                                                  , PHC
                       14HTHTA,4H
746
                                                                 JTOTACE
                       TAMCELZJAM
                                       CELZ
                                                  JUHTOTA, WHEE
748
                                                                  ,OY
                                                  HAL YOHAL
                        14HCZ JAH
                                       DZ
745
                                                                  DTHTA
                       14HCPHI.4M
                                       , CPHI
                                                  AHDTHT, 4HA
750
                                                                  ,DPS1
                              , 4H
                                       ,DX
                                                  , 4HDPSI, 4H
                        14HCX
751
                                                  ,4H0Q ,4H
                       SAMOR
                               14H
                                       , DR
                                                                  , DC
752
                               ,4H
                                                  , 4HDW
                                                                  .0%
                                       , DP
                        14HDP
                                                         ...
753
                                                         - 4W
                                                                  TOV-
                        THMCU
                                       700
                                                  TAH!V-
754
                        14HVRW .4H
                                        , VRL
                                                  , AHMACH, 4H
                                                                  MACH
755
                                                                  , PS1
                        14MCAP
                               144
                                       JCAP
                                                  , AMPSI , AM
756
                               , 4H
                                       , P
                                                  , AHO
                                                                  , C
                                                          , 4H
                        14HP
757
                                                                  PELVY
                                       18
                                                  , AHDEL V, AHY
                        14HR
                               ...
758
                                        , AZB
                        14HAZE 34H
                                                  * #HUELX * #HV
                                                                  , DELXV
760
                                                  JAHDELZJAHV
                        THEELYJAHV
                                        TOELYV
                                                                  すりをヒてV
781
                               , 4H
                                                        , 4, H
                                                                  , Y
                                        ,X
                                                  , 4HY
                        14HX
762
                                                  ---
                                                                  AMP
                               , 44
                        14HZ
                                        Z
763
                        14FXT
                                                  JAHYT JAH
                                                                  , YT
                               , 4H
                                        JXT
764
                        14HDTHT/4HA
                                        ATHTA
  1.
                        14HCPHIA4H
                                        CPHI
                                                  , AHSPUI, AH
                                                                  , SPHI
766
                                                                  79PS1
                                        TCPS1
                                                  74HSPS174H
                        14HCPS174H
747
                                        CPSIS
                                                  . HGZB .4H
                                                                  , GZE
                        14HCPSI,4HS
 768
                                                                  .GXE
                                                  JAHGX8 JAH
                        14HGYB JAH
                                        SYDI
  7.4
                         PRINT 90000,4,4HAUTO,4HPILO,4HT1
771
                        14HDDPH/4HIO
                                        , DDPHIO
772
                                                                  PEG
                        14HCELX,4HS
                                        DELXS
                                                  , AHPEG ,4H
773
                                                                  TXED
                        TAMCECMJAH13
                                        TOELHIS
                                                  JAHTXEDJAH
774
                                                  . AHAMEG, 4HA
                                                                  . OMEGA
                        14HDELZ,4H9
                                        . DELZS
775
                                                                  , OPEF
                                                  JAHDPEFJAH
                        14HDYEF . 4H
                                        DYEF
776
                                                  HAL YTPHAL
                                                                  , RTM
                        14PDTHT, 4HAS
                                        CTHTAS
777
                                                                  PEFL
                                                  , AHPEFL, AH
                        14HKT JAH
                                        JKT
775
                                                                  DELR
                                                  , AHDELP, AH
                        14HNULL,4H
                                        ANULL
779
                                                                  PSRG
                        TAMBMEGTAMZ
                                        JOMEGZ
                                                  , 4HPSPG, 5H
750
                                                                  PEF
                        14HPED JAH
                                                  , AHPEF , AH
                                        PED
781
                                                                  "puig,
                                                  ,4HPH1G,4H
                        14HPITE JAHRO
                                        IPITERP
 782
                        14-PS15,4H
                                        PSIS
 783
                                                  14.25HTH&C
                                                                  , THBS
                                        PXED
                        14HPXEDJ4H
 784
                        14HPS85,4H
                                        ,PS85
                                                                  , DEL1
                                                  , AHDEL1, AH
725
                                                  JAHREAMJAHP
                                                                  FREAMP
                        1-4HRUAM74HY
                                        JRUAMY
786
                                                                  PPPHT.
                        14HTHTA/4HS
                                        , THTAS
                                                  , AHTHOB, AHS
787
                                                                  , FEF
                                        JYEF
                                                  JAHPEF JAH
                        14HYEF JAH
788
                                                  , AHPED , 4H
                                                                  , PED
                        14HYED JAH
                                        , YED
785
                                                                  , YBRG
                        14HYEF JAH
                                        JYEF
                                                  JAHYBRGJAH
790
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.CELYS
                                      YEG
                                                 , 4HDELY, 4HS
791
792
                       14HYEG JAH
                                                                 , VĂ - C 7A
                                      YALERR
                                                , LHYALF, LHRA
                       I AHYAWE, AHRR
                                                                LAMDE
                                                , 4HLAMP, 4HR
                       14HLAMY, 4HR
                                      , LAMYR
793
                                      JGSX
                                                                ,CAPS
                                                JAHGAPSTAH
                       TANGSA TAN
794
                                                                 , IACA
                                                 , 4HIACG, 4H
                       14HDPSI, 4HS
                                      ,DPS1S
795
                       14HPSR8,4HS
                                      PSEBS
                                                 , AHREL , AL
                                                                 , RE.
796
                        PRINT 90000,2,4HL6G1,4HC1
797
                                                                PIGATE (COP);
                                     1, GATE (001), 4HGATE, 4H
                       14MBATE, 4M
798
                       24HGATE, 4H
                                     3, GATE (003), 4HGATE, 4H
                                                                4. GATF (CO4).
799
                                     SIGATE (005) THEATE H
                                                                KIGATE (DOA):
                       ZAHGATEJAM
800
                       34HGATE, AH
                                     7,GATE (007)
801
                        PRINT 90000,4,4HAERB,4HDYNA,4HMICS,4HI
802
                                                                ALB
                                       ,CLD
                                                 JAHALA JAH
803
                       14HCLD JAH
                                                 AHCHS JAH
                                                                 , CMG
                       IAMENR JAH
                                       JCNR
804
                                                                 , CAZ
                       14HCY JAH
                                       CY
                                                 JAHCAZ JAH
805
                                                 THICK - JAH
                       THHELP JAM
                                                                 LCA.
                                       7000
806
                                                 . AHCHEG. 4H
                                                                 , CMCG
                                       *CYCG
                       14HCYCG, 4H
807
                                                                 CLS
                       TAMANE JAM
                                       JANE
                                                 JAHCLA JAH
808
                                                 AHCND JAH
                                       ,CMB
                                                                 , CNB
                       14HCMB JAH
809
                                       THASE
                                                                 DTHARD
                                                 DRYA, AHTCHA,
                       14HTHAS, 4HD
  1.
                                                                , CPS19C
                                                 JAHDPS1JAHSD
                       14HPSIS, 4HD
                                       PSISD
  5.
                                                                 7887X
                       1 4HALPHJ 4HA
                                       TALPHA
810
                        PRINT 90000,1,4HRAP1,
811
                                                 JAHCTT JAH
                                                                 CTT
                                       STT
                       14MSTT JAH
$12
                                                                 CPT
                                                 JAHCPT JAH
                       14HSPT JAH
                                       , SPT
 813
                       14474 ....
                                       ,TH
                                                 JAHXLTAJAH
                                                                 XLTA
  1 4
                        PRINT SOCOO, 3,4HCEBU, 4HG PR,4HINTI,
815
                                                                 JOELYA,
                                       JUELX8
                                                 SHELLATEDHAL
                       14HDELXJ4ME
516
                                                 , LHDELX, 4HS
                                                                 DELYS,
                       14HDELZ,4HB
                                       , DELZE
  1 .
                                                 , AHDELZ, AHS
                                                                 DELTS.
                                       , CELYS
                       14HDELYJ4H8
 818
                       14HKUTT# 4HA
                                       KUTTA
 819
                                                                 , VANFRR,
                       14HPITEJ4HRR
                                       PITERR
                                                 JAHYAWE, AHRR
 820
                                                 JAHTANE JAHRA
                                                                 , YAHERE.
                                       , PITERA
                       14HPITE, 4HRD
 821
                                                 JEHRS JOH
                                                                 773
                       34HDRLAJ4HPY
                                       JORLAMY
855
                                                                 DRTHTA
                                                 , AHDRTH, AHTA
                       34HDRPS, 4HI
                                       , DRPSI
 823
                                                                 RPHIS
                                                 JAHRPH! JAHG
                       34HCRPH, 4HIG
                                       DRPHIG
 874
                                                  , AHDPHI, AHO
                                                                 ,DPH10
                                       , DEL VR
                       14HDELV, 4HR
 825
                                                                 . 4547
                                                 JAHVSNDJAH
                       14 HG
                               , 4H
                                       13
 826
                                                                 JACT
                        14HISKR, 4H
                                       , ISKR
                                                 , WHIACT, WH
 827
                                                                 <del>, 18</del>*P
                                                 ·JAHTRAPJAH
                        14H10UIJ4HDE
                                       TIBUICE
 828
                                                                 NAVY
                                                  ,4H4AVY,4H
                        14HKAGEJ4H
                                       , KAGE
 829
                                                                 DRLAMP
                        34HF1 J4H
                                       JF1
                                                  JAHDRLA, AHPP
 830
                                                  , AHIPRI, AHNT
                                                                 , IPRINT
                        LAHNÜM JAH
                                       ANUM
 831
                                                                  NOT
                                                  JAHNDT JAH
                                       JAPPS
                        1445999144
 832
                                                                  NULSKR
                                       ANDTA
                                                  JUHYULS, 4HKR
                        14HNDTA, 4H
 833
                                                                  TPHIG-
                                       TFEFL
                                                  JUHPHIG JUH
                        ga<del>mpeflach</del>
 834
                        14HRH8 34H
                                        RHE
 P35
                                                  , ahoelr, ahol
                                                                  .DELP9L
                        14482 744
                                       ,52
 836
                                                                 RET
                        14HRED JAH
                                                  JAHRET JAH
                                       PRED
 837
                                                                  , RPS!
                                       PFO
                                                  , 4HRPS1,4H
                        14HREG JAH
 838
                        14HRTHT JAHA
                                       PRTHTA
   1 4
                                                                JAHAMERJAMZ-
                        <del>141004607411</del>
                                        794E34
 840
                        14HNX JAH
                                        . NX
 241
                         IF(IMPACT)PRINT 90000, 2, 4HIMPA, 4HCT: ,
                  72
 842
                                                                  , PCAX
                                        PEAT
                                                  , 4HPCAX, 4H
                        14HPCAT, AH
 843
                                                                  ,PCAZ
                                        PCAY
                                                  JAHPCAZJAH
                        14HPCAY, 4H
 . 44
                                        PCA
                        14HPCA #4H
 845
                                                                                   FND RUN
                                                           -IP (-IMPACT
                                     <del>-- «የተጠተ</del>ሞት ተ
 846
                          CBNTINUE
                   50
 847
                  C
 贝兹男
                         DISPLACEMENT ERRORS FROM AIM POINT
 849
                  C
 850
```

· DAY

```
851
                C
                       DISPLACEMENT ERRARS FROM SPAT
852
                       DELXEXTOX
853
                       CELY YT-Y
854
                       CELZEZTEZ
                       IF (TIME+LT+TIME+)GB TB 51
855
856
                C
                       IF (ABS(DEL1 ).GT.CELMY)DEL1 #SIGN(DFLMY, DFL1)
357
                          (ABS(DELVP).GT.DELMX)DFLVPASIGN(DFLMX, DFLVP)
858
                       IF (ABS(DEL3 ).GT.DELMY)DEL3 +SIGN(DFLMY, OFLR)
859
698
                       10
                          TABSTODELVP1 . GT. VRATE 100ELVP4STGN( VRATE, DOFLVP)
                       IF (ABS(DDEL1 ).GT.VRATE)DDEL1 .SIGN(VRATE,DDEL1 )
861
862
                       IF (ABS(DDEL3 ).GT. VRATE)DDEL3 .SIGN (VRATE, DDEL3 )
863
                       IF ( IACT . GT . O ) GO TO 51
                       CEL1 . YEG-REG
864
865
                       CELVP . PEG
                       DELS # #YEGEREG
866
867
                       IF ( IACT . EG . 2 ) DEL 1 9REG - YFG
                       IF(IACT.EG.2)DEL3#REG+YFG
868
869
                    51 CONTINUE
870
                        RETURN
871
                C
                        ENTRYFIVISH
872
873
                C
874
875
                       IF (IACG+EG+1)GB TB 40
                       XT & XT+DTRK+VXT
875
                       YT . YT+DTRK+VYT
877
878
                      CONTINUE
                       VMS#L#U+V#V+W#W
879
                       VH#SGRT (VHS)
880
                       TOTACCH (SGRT(AYB#AYB#AZB#AZB))/MASS
881
                CH####TRAJECTORY TERMINATION
582
883
                       IF (TIME . GT . 5. . AND . Z . GT . ZMIN) GO TO 45
                       IFIZALTAZPINIGO TO 157
184
                    45 CONTINUE
885
                       DELXT # XT#X
884
                       CELYT . YT-Y
887
                        ELZT . ZT-Z
588
                       DELXTBUEB11+DELXT+ER12+DELYT+EB13+DELZT
885
                       DELYTS*EBZ1*DELXT*EBZ2*DELYT*EBZ3*DELZT
790
891
                       DELZTE . EB31 . DELXT + EB32 . DELYT + EB33 . DELZT
                CHR LOS IN ECS
892
                       VERLAMBATANZ(-DELZ, SGRT (DELX+DELX+DELY+DFLY))
893
854
                       MORLAMWATANE (DELY, DELX)
                CAM TATAL MISSILE NON-FIELD ACCELERATION
895
896
                       GAMPH-ATAN2 (W.U)
897
                       RTUWS#SCRT (U#U+W#W)
898
                       GAMYWATAN2(V, RTUNS)
899
                C- RCS TO VCS TRANSFORMATION
900
                       CALL TRSFEY
901
                       902
                       G0 T0 73
303
904
                  157 CONTINUE
                CONNO RANGE TARGET FROM MISSILEBRY IN FEFT.
905
                       RTP#8GRT((XT#X)##2+(YT#Y)##2+(ZT=Z)##2)
906
                CONNA POINT OF CLOSEST APPRHACH CAMPUTATION = PCA IN FEFT.
907
                       1F(RTH+GT+PCA)G6-T6-55-
908
                       PCAT = SNGL (TIME) ; PCAX = X; PCAY = Y; PCAZ = Z; PCA = 9TM
905
                   55 CONTINUE
910
911
                       G0 T0 9
                       IMPACTO . TRUE .
                73
912
```

· Est

913		IPRINT#2
914		PRINT 90000,2,441MPA,440T1,44T1MF,44 ,TIME
914		G8 T8 9
916	9999	GAYE(OUP)#8FT
917		ERROR . TRUE.
018		G8 T8 70
019	9998	PRINT 900CO,5,4HEND=,4HRF=F,4HILF ,4HRN U,4HNITI,
990		YAMEST AMT ALUNIT
921		08 3,21 1-1,16
458	3151	- MOXC(1) VCs
923		C8 3122 I=1,1500
924	×	CALL WDACS(0,16,MDAC)
925	3127	CONTINUE
1*	-	CALL BERF (IE)
Ş*		CALL WERF#89
7.0		CALL MERFACE
926	X	CALL MODE('R')
927	X	CALL MODE ('PI)
926	X	CALL WEOF
029	X	CAL! PLRT(1, TIME',2, TXED 1)
930	×	CALL FGERLS(INV I)
931		STAF
932		EVC

```
SLBRAUTINE SFEKERISPNGE, REFLEC, ERR, FRA
 1
                      CIMENSIAN TRAGE(18), TEFLEC(2), THE(18,2), T. GO. 161, TEGG 113, 11
CIMENSIAN TRAC(6)
 3
 -
                      TAYX TRNOE/100, 200, 300, 400, 400, 10, 100, 100, 100, 100, 200, 3100,
 5
                     14000.,5000.,6000.,8000.,10000.,12000.,14 ...,6000./
                      DATA TRFLEC /1.25,5./
                      CATA TLOS /-1.5,-1.737,-1.167,-1.10.877,-167,-167,-17.0.333,-167, ..
                     1.167,.333,.5,.667,.833,1.,1.167,1.333,1.5/
 ٥
                      DATA TRAD /4.3E-14,4.6E-17,4.5E-12,4.1E-11,4.1E-17,2.6E-9/
                      DAYA TMS79+3E-11,2.6F-1119+4F-12,5.6F-17,7.6F-17,2.6E-12,1.46+17,
10
                     19-0E-13,2-1E-13,9-3E-14,5-0F-14,7-0E-14,2-2F-14,1-4E-14,7-5--15,
11
                     25.0E+15,3.6E-15,2.6E-15,
12
13
                     33+7E+9,9+CE-10,3+7E+11,2+1E+11,1+4E+11,9+2F+12,5+CE+12,3+3E+12,
14
                     48.4E-13,3.7E-13,2.0E-13,1.4F-13,8.4F-14,4.6E-14,3.CE-14,2.0E-4,
                     51+8E=14,1+05E=14/
CATATTEROTYZEFFE:F=1+95;*1+86;+1+8;*1+72;+1+5;*1+29;*+65;;+7+55;
15
16
17
                     1.75,1.05,1.2,1.3,1.4,1.5,1.5,1.6,
                     2+4,,+4+,+3+95,+3,85,+3+6,+3,35,+2+8,-2+1,++85,+6,2+15,3+1,3+45,
18
19
                     33+7,3+75,3+9,3+95,4+,4+,
                     4 = 4.7, = 4.7, = 4.65, = 4.5, = 4.5, = 4.2, = 3.2, = 2.6, = 1.15, .7, 2.3, 3.2, 3.5, 3.7,
                     53.75,3.8,3.9,3.9,3.9,
21
                     72
                     72 - 1 , 2 - 4 , 2 - 5 , 2 - 6 , 2 - 6 , ? - 6 ,
53
24
                     8=3.55;=3=55;=3=5;=3=4;=3=2;=3=0;=2.55;=2-5;=1.8;=-9;=-4;+05;+25;
25
                     9.5, .7, .9, 1 ., 1 . 05, 1 . 1,
26
27
                     A=2.4, ~2,4, ~2.35, -2.3, ~2.2, ~2., ~1.85, ~1., -1.1, ~.95, ~.8, ~.5, ~.35,
                     5--2,--1,--05,-025,-05,-05/
58
                      CIMERSION ANSINI AENDINI
29
                      DATA IS, IR, JH/3+0/
30
                      1 :15
                      CALL FIND(I, TRAGE, 18, SRAGE)
31
32
                      IF(1.EQ+15) 00 TO 10
¥£
                      15.1
                      Ċ׼Ľ
34
                            HTERP (AMS) THE LITTENGE TIS ANTRELECT
35
                   10 H8. FUNCTION (AMS, SPAGE, REFLEC)
                      RRRSERR+57+296
36
                      14151 JPUH
17
                      CALL FIND(1, TLOS, 19, RRR)
CALL FIND(J, TRAD, 6, MS)
15(1+NEv18) 00 75 20
38
35
¥U
                      IF (J.EQ.JH) G8 T9 30
41
                     ISTI JHTJ
CALL NTERP (AEND, TERB, LATLAS, 19, J, TRAD)
42
                   20
43
                      ENDEFUNCTION (AEND, RRR, HS)
44
                      ERR . END/4./57.296
45
                      RETURN
*8
                      END
47
```

6.37

```
SUBRRUTINE AFRO (T1:T2:FMACH:ALPHA;BETA;OF F:T;OF:YAA;OSUCBU;
CN:CMCG:CY:CLRCG:CA:CLP:CLD:CMB;CMAC;O!X4;CLXAC)
MM
                                            c
  1
                                            ֓֞֜֞֜֜֓֓֓֓֜֜֜֜֜֡֓֓֓֓֜֜֡֡֓֓֓֓֡֡֡֡֡
                                                               INPUTS
                                                                                         * TIME * SEC. * TIME TO START CONTROL PHASE * CFC.
                                                               T1
                                             č
                                                               FFACE
                                                                                         . FREE STREAM MACH NUMBER
                                                                                        . ANGLE AF ATTACK (PITCH PLANE) . PTG.
                                                                ALPHA
                                                               RETA
                                            CCC
                                                               CELPIT - CANTROL CEFLECTION ANGLE (PITC- PLANE) - CEG-
CELYAM - CONTROL DEFLECTION ANGLE (YAM PLANE) - NEG-
CELRAL - CONTROL CEFLECTION (ROLL) - DEG)
11
12
                                             C
                                                                SUTPLT
45
                                                                                       A MORMAT PRACE CORES
                                             COCC
16
                                                                                         . PITCHING MOMENT CHEFF.

TAN FORCE CHEFF.

TAN MOMENT CHEFF.
 17
                                                               CFCG
                                                                 ČLNCO
 19
                                                                                           . AXIAL FORCE CREFF
 23
                                                                                        * AXIAL FORCE CHEFF. * (1/RAD)

* ROLL DAMPING COEFF. * (1/RAD)

* ROLCH CAMPING COEFF. * (1/DEG)

* PITCH CAMPING COEFF. DUE TO THEYA DOT

* PITCH DAMPING CREFF. DUE TO ALPHA DOT

G YAN DAMPING CREFF. DUE TO ALPHA COT

* YAN DAMPING CREFF. DUE TO ALPHA COT
                                                                 CLP
 21
                                                               CFG
                                            0000
23
                                                                 CPAD
 24
 25
                                                                 CLAR
                                             Ċ
 26
                                                                 CLNAC
 27
                                                                 TABLES
                                                                                        • TABLE OF CN FOR CONTROL PHASE

• TABLE OF CMCG FOR CONTROL PHASE

• TABLE OF CA FOR CONTROL PHASE

• TABLE OF CN FOR BALLISTIC PHAGE

• TABLE OF CMCG FOR BALLISTIC PHAGE

• TABLE OF CA FOR BALLISTIC PHAGE
23
                                              0000
                                                                 TCAL
                                                                 TCMC61
 30
                                                                 TCAL
 31
 32
 33
                                                                 TCMCG2
                                                                                         * TABLE OF CPCG FOR BALLISTIC PHASE

* TABLE OF DELTA FOR CNACHCG

* TABLE OF FMACH FOR CONTROL PHASE

* TABLE OF FMACH FOR BALLISTIC PHASE

TABLE OF FMACH FOR BALLISTIC PHASE
                                                                  <del>76x2-</del>
                                                                  TOELTS
                                              c
 35
                                                                 TPACH!
 36
                                                                 THACHE
                                              000
                                                                                          - TABLE OF FMACH FOR CLF,CLD
                                                                 TF & CHS
 38
                                                                 TFACHA
                                                                                          . TABLE OF FMACH FOR CMG
 39
                                                                                           -- TABLE - EF-FYACH-FOR-CA-(BAUL-15T1C-FUASF)-
                                                                  TEACHS
 30
 41
                                                                 COUBLE PRECISION TIJTE
 42
                                                                 CIMENSIAN TALP(6), TOEL(1(7), TCN1(6,7,3), TCN2(6,
CIMENSIAN TEMEGI(4,7,3), TEMEGI(4,7,3), TEAL(4,7,3), TEAL(
                                                                                                                                                                                          TCN1(6,7,3), TCN2(6,5)
 43
 44
                                                                 -DINENSION-THACHITSTYTHACHELSTYTHACHST-STYTHACHALSTYTHACHSLIDT
-- 4 6
                                                                                                                                  ACMCG(R), ACY(8), ACLNCG(R), ACAP(R),
                                                                    CIPENSION ACTION
 47
                                                                                                                                                                  ACLDIZI, ACHDIAI, ACLNE(6)
                                                              1 ACAB(8), ACAB(8), ACLP(2),
CIMENSION ISAVE(13)
 48
 49
                                                                                                     ISAVE
                                                                    DATA
  50
                                                                  CATA TEN1
                                                                                                                                                                                                          71796-
                                                                                                                                                                                                                                         73.19
                                                                                                                                                                                                                                                                                    <del>~20</del> +*
                                                                                                                                                                    ----
                                                                            ~1+<del>25</del>
                                                                                                                                      - ,--
                                                                                                                                                                                                          12.4
                                                                                                                                                                                                                                          ,3,39
,3,45
,3,6^
                                                                                                                                                                         #1+35
#1+81
                                                                                                                                                                                                                                                                                   -10 .4
                                                                                                          1-106
                                                                                                                                          , • 4
                                                                              -1.2
 54
                                                                               -1.
                                                                                                           1.35
                                                                                                                                            .1.32
                                                                                                                                                                           12119
                                                                                                                                                                                                                                                                                          7 ..
                                                                                                                                                                                                                                           ,3.8
                                                                                                                                                                                                            12.94
                                                                                                                                                                           12.29
                                                                               • 0
                                                                                                           1.93
                                                                                                                                            .1.8
  56
                                                                                                                                                                                                           17.35
                                                                                                                                                                                                                                           , 3 . 95
                                                                                                           11+3
--1+4-
                                                                                                                                            11.84
                                                                                                                                                                           12143
                                                                                                                                                                                                            ,4+2
                                                                                                                                                                                                                                           .4+03
  44
                                                                                                                                                                                                                                           ,3.3K
                                                                                                                                                                                                                                                                                   -20 .4
                                                                               -1-35
                                                                                                                                                                           11.48
                                                                                                                                                                                                           . 2 . 1
                                                                                                           ,-,9
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  94
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                                                                                                                                                                                                           ,2,54
                                                                                                                                                                                                                                           :3.67
                                                                                                           1--65
                                                                                                                                            ,..
                                                                               -1.25
  60
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                                                                                                                                                                                                           ,2.89
                                                                                                                                                                                                                                           , 3.89
                                                                               -1-1
                                                                                                                                            ,1,45
                                                                                                                                                                            . 2.29
                                                                                                                                                                                                            13.1
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                                                                               -.56
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\_ (EM

43	×	• C	11.05	.1.85	,2.*4	43.31	14.28			
64	X	• 48	11.38	11.95	17164	13.4"	4 1 3 3	,		
45	×	1 •	11.56	1.5.	.2.8	41.56	, 4 . 4	,	1	
LL	x	-21	4-1-17	1172	11.23	,2,5	14113	,	-80	
47	x	-1.7	1-144	, • 9 9	11.7	13.24	4.64	,	-15	1.
44	X	41.2	4.0	.1.	7.24	.3.62	.3.65			;;,
69	x	• • •	/ • 4 R	1.76			15:63	•		1 •
_	â	-			12175	44.05		•		-
70		•0	11.05	15.5	13.7	4.25	12.15	•		1.5
71	×	.43	11.6	15.6	13144	14.28	12.38	•		1.4%
78"	" <b>X</b>	1#	1512	12.85	1315	. 4 . 34	12141	1	10	112
73	<b>-</b> .	A TCHE								
74	X	.0	1.93	.1.8	.2.29	,2.94	13.8		C	
78	X	• C	# 1 + C5	12.85	.2.54	.3.31	14.28	,	۲	• A
74	X	•0	11.05	,2.2	.3.3	.4.25	15.32	,	-	1 • "
77	X	•0	1.85	11.8	28.54	44.2	.5.6	,	5	1 . 1
78	X	40"	1189	11.4	1215	17.5	1715	,		1 +8
79	DAT	A TCHCE			, , , ,	, , , ,	• • • •		-	• • •
80	X .	3+6		, 3, 35	.2.35	.1.8	.1.3		-20	
81	. x	3.4	13:12	,1,9	41.1	8	, , ,	;	-15	
	ž	7184							-	
11			#1+57	, • 53	1-125	4 5	/+2	•	-10	
82	X	1 . 25	1.37	J= + 75	1.37	70	<b>,-,</b> 3	,	-5	
14	х	•0 -	j=1.25	1.8.	1-1.62	**112	14178	,	0	
88	X	-1-1	1-8.35	1-8-5	·-1.7	44145	/ ~ 1 + 35	6	5	• •
84	X	-2.7	107.9	, = P + 25	2 . 05	4-1-94	J-1+65	,	10	. 4
R7	X	3 - 25	.4.	.3.6	.2.14	11.7	J . I .		-20	. 8
3.8	×	3+4	13.2	11.55		1	4441		-17	. 8
11	x	3+1	11.65			4 • • 7	25	,	-10	. 8
70	<del></del>	1180	113	#T+08	1-1-5	41175	-74187		**	-
91	γ ×	• 0	1-1-7	*=\$ · \$8	2.5.4	1-98	-1.62	;	ō	
	â-	•1•2	/*Z.87	1-5.56	,-2.5		1-1-8	;	š	
35	Ŷ					1+8+35				
93		-3.94	1-2-1	,•3·	1-2.98	4-717	1-2-14	,	10	-
54	X	5+9	14.94	13.17	1142	.1.3	/1+	,	-20	
98	×	4.75	13.32	,1.52	,.51	4	3-479	•	-15	
74	X	1/22		1 all	3#1.12	1-212	1-2-1	- ,	-10	
97	X	1.7	4.05	1-1-42	3.0	3+5	1-2-72		~5	
98	X	• 0	J-1.45	1-3-35	1-4-4	10441	1-3-04	,	0	1 . C
99	X	-1-23	/+3.3	. * 4 • 57	4 . 75	4.3	1-3-2	,	5	1.0
100	×	-2.95	144.7	1-5-27	1-4.5	4-4-45	/-3-38	,		1.0
101	DAT	A TCMCG				• • • • • •				
108					Sector	TUTUE	Partico -	. ,-	-0-	-+
103	ŵ	•0	/=1.7	1-5-58	,-2.2	1 · 9 R	-1.52	,	ŏ	
	ŵ	•0	-1.45	1-3032	, 44,4	10411	-3.04	į,		1.0
104	ŷ						47.65			1.3
109		•0	/*•9	-1-8	, -2.38	2.17		,		1.4
104	×	•0	/124	, ~ . 45	a = +57	4-457	·*•67	/	9	1
107		A TCAL								
108	<del>x</del>	171	7¥69"		7 4343·	2117¥	1-103	,	-50	-
109	X	.585	J • 506	, • 3 <b>4</b> 7	1.24	4.173	02	,	-15	
110	×	. 435	1.38	1 * 275	167	102	2.09	,	-10	• •
111	X	. 324	J • 311	1 . 2 6	1.24	1.245	* • 5.5		-5	. 4
118	X	. 295	1.274	J+313	1.341	1.323	19	,	0	. 4
112	×	. 32	4 - 166	. + 412	1.476	25	04	,	5	. 4
	<del></del>	742	7187	- 14905 -	1187	43824	275	·	- 10	**
444	Ŷ	.76	4.767	11452	3 1 7 1 9	2124	4.061	į	-20	
118	â	• 63			1.717	1.153	4.068	,		
116			14384	435				•		• A
117	X	.61	1.419	11348	25	1.196	4 • 153	•	-	
118	X	• 370	1 • 352	J + 10F	1.301	4.29	, , 26	,	•5	
119	×	. 138	336	381	•• <del>1</del> 90	03	4 - 387	,		• 5
110	<del>*</del>	~ 4373~ •	**************************************	7 4485 .	1051		**519	•		* H
121	×	.475	53	J.581	2 . 6 7 5		66	,	10	
172	×	1 - 23	11:11			7	210	,	-50	1 · C
123	×	1.06	4 + 655	709	5A	767	175	,	-15	1.0
124	x	179	/ 1473	61	4.515	4.356	4884	,	-10	1.0
367	~							-		

. JA

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1.54
1.58
1.775
                                                               / •58
/ • • 95
125
                                    .643
.582
                                                 1 . 605
                                                                                                          #1382
#150
#174
                                                                                                                               5 11°
                                                                                           1.456
                                                 1 . 6 1
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127
                                    .63
                                                 . . 685
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                                                                                           1.769
                                                                             7 7918
                                                 7 . 83
                                                               7190
                                                                                                          1179
                                                                                            1.92
129
                              DATA TCAZ
                                                               1 .31,.314,.32,.332,.367,.424,.535,.58,
                              ( -6150-639,-645,-639,-628,-60,-565/
DATA TALP /0-,5-,10-,15-,
DATA TALP4 /0-,4-,6-,8-,
130
131
                                                              10.,5.,10.,15.,20.,25.,
132
                                                                 100,40,60,80,100,120,140,160,180,200/
133
                              CATA TOELTS
                                                                /-20.1-15.1-10.1-H.10.15.110./
134
                              DAYA THACHS
                              DATA THACHS
                                                                 /.4,.8,1.0,1.3,1.8/
135
136
137
138
                                                                 /.4,.8,1.0,1.3,1.8/
                              CATA THACHS
                                                                  /-4,-6,-8,1.0,1.2,1.4,1.6,1.8/
-4,-5,-6,-7,-8,-85,-9,-95,1.0,1.1,1.2,
                              DATA THACHS
139
                             X 1.3,1.4,1.6,1.8/
                              DAYA TELP
140
                                                             <del>/#$$#67#$7#77#?$#C7#?$</del>#3#?6###<del>$</del>$###<del>?</del>*##$#####
                              CATA TELD
141
                                                              /+085,+087,+090,+097,+086,+073,+061,+049/
                              CATA TOME /
                             X =185,,=165,,=162,,=125,,=100,,=101,,=107,,=108,,=105,,=107,,

X =15C,,=185,,=190,,=165,,=135,,=108,,=75,,=75,,=75,,=75,,
143
144
145
                                 -160-,-205.,-218.,-220.,-234.,-240.,-246.,-227.,-180.,-107.,
148
                                 -178+1-174+1-195+1-195+1-194+1-198+1-158+1-174+1-146+1-110+1
147
                                 +130+,+156+,+162+,+155+,+150+,+143+,+134+,+120+,+105+,+87+/
                              ABBET # ABS(ALPHA)=57.296
ABBET # ABS(BETA )=57.296
IF:T1:LT:T2) 00 TO 2
148
149
150
                              DELP = DELPIT=57.296
DELY = DELYaw=57.298
IF(ALPHA-LT-0+) DELP==DELP
151
167
153
134
                               TP(BETA-LT+0+) DELYHODELY
                               1 . [SAVE(1)
155
156
157
                                K . 18AVE(3)
158
                                CALL FIND(I) TALP) 67 ABALP)
                               CALL FIND(J, TDELT1, 7, DELP)
CALL FIND(K, THACM1, 3, FHACM)
IF(1 +NE+ ISAVE(1))
IF(J +NE+ ISAVE(2))
159
160
                                                                          Gn T0 50
Ga T0 60
161
162
                                IFIK .NE. IBAVE(3))
                                                                          Ge TO 70
163
184
                                <del>08-70-80-</del>
                                ISAVE(1) . 1
165
                       50
                       •0
                                IBAVE(E) + J
167
                       70
                                CONTINUE
                                CALL NTERP (ACN, TEN1) 1, TALP, 6, J, TDELT1, 7, K, TMACH1)
168
                               CALL NTERP (ACHCG, TCMCG)

CALL NTERP (ACHCG, TCMCG)

CALL NTERP (ACAP, TCA)
169
170
                                I . ISAVE(4)
                       80
172
173
                                V + 1844E(5)
                               CALL FIND(1, TALP, 4, ABBET)
CALL FIND(1, TDELT1, 7, DELY)
174
                                IF(I :NE: ISAVE(4))
                                                                          GR TR 150
175
                                IPIU-VNEV-18AVE(S))
178
177
                                                                          da-10
                                                                          G8 T0 180
                                IF(K .NE. ISAVE(3))
178
                                G8 T8 18C
                               18AVE(4) = 1
18AVE(5) = J
179
                       15C
                       160
180
                                CONTINUE
181
                                <del>CALL::NTERP~(ACY)TCN1717TALP187</del>J,TDEt:T1777K;+MACH1-----
182
                               CALL NTERP (ACLNCG, TCMCG1)
CALL NTERP (ACAB, TCA1)
IF(X +EG+ 15AVE(3))
183
                       180
185
                                                                          GA TO 197
                     c
186
```

÷

PA

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187
                   SET I & J FOR ALPHA & OFLIA & A.C IN TAIR & TORITS
188
189
                        1 * 1
130
                        CALL NTERP (ACAR TCAS , TATALP , 6 , ... TOFLT 1 . 7 , K , Th ACL 1)
191
135
                        ACA8(2) # ACA8(5)
                        ISAVE(3) " K
193
                  190
                        CONTINUE
194
195
                        CN
                                    # FUNCTION (ACN, AGALP, DELP, FMAC-)
                        כאכם
                                   * FUNCTION (ACTOG)
196
                        CAP
197
                                    S FUNCTION (ACAP)
                                    . FUNCTIONIACY, ARRETIDELY, FMACHI
158
                        CY
                        CLNEG
                                   * FUNCTION (ACLNCG)
199
                        CAB
500
                                    * FUNCTION (ACAB)
                        CAS
                                    # FUNCTION (ACAS, FMACH)
201
                        CA E CAP + CAB - CAB
505
                        G6 T6 3
203
                 C
204
205
                  5
                        I . ISAVE(6)
                         J # ISAVE(7)
206
207
                        K # ISAVE(8)
                        CALL FINDITY TALPY 67 ABAUPT
208
209
                        CALL FINDIJ, TMACHE, B, FMACH)
                        CALL FINDIK, TALP, 6, ABBET)
210
                         IF(J ."E. ISAVE(7))
                                                          G8 T8 250
211
212
                         IF(I .EG. ISAVE(6))
                                                          GB TE 260
                         ISAVE(6) * 1
                  250
213
                         CALL NTERP (ACK, TCV2) 1. TALP, 6, U, TMACH21
214
                        CALL NTERP (ACMCG, TCMCG2)
215
                         IF(J .NE. ISAVE(7))
                                                          GA T8 270
216
                  590
                         IF(K .EQ. ISAVE(8))
                                                          GA TO 280
217
                  270
                         ISAVE(7) # J
218
                         ISAVE(8) # X
219
                         CALL NTERP (ACY, TCN2, K, TALP, 6, J, TMACH2)
חקנ
                              NTERP (ACLNCG, TCMCG2)
                        CALL
155
555
                  280
                         I W ISAVE(9)
                         CALL FIND(1, THACHS, 15, FMACH)
553
                         IF(1 +EQ+ ISAVE(9))
                                                          38 T7 290
224
                         ISAVE(9) . I
225
                         CALL-NTERP (ACAPYTCA2) TYTHACHS)
226
                        CONTINUE
227
                  590
                        EN.
                                    # FUNCTION (ACN, ABALP) FMACH)
228
                        CPCG
                                    . FUNCY INN (ACMCG)
559
                                    * FUNCTION (ACY, ABBET) FMACH)
230
                        CY
                                    . FUNCTION (ACLNCS)
                         CLNCG
231
                                   <del>ĸ~FUNCTION (ACAPJEMACH)</del>
535
533
                 C
                         I # ISAVE(10)
                  3
234
                         CALL FIND(1) TMACH3, 8, FMACH)
235
                         IF(1 +EG+ ISAVE(10))
                                                          G8 73 350
736
237
                         ISAVE(10) + I
                         CALL NTERP (ACLP) TOLP) 12TMACH31
238
                        CALL NTERP (ACLD, TCLD)
239
                         I . ISAVE(11)
                  350
240
                         J # [8AVE(12)
241
                         K = ISAVE(13)
242
                         CALL FIND(1, TMACH4, 5, FMACH)
243
                         CALL FING (JATALPHA 103 ABALP)
244
                         CALL FIND(K, TALP4, 10, ABBET)
245
                         IF(1 .NE. ISAVE(11))
                                                          88 T3 360
246
                                                          GA TR 370
                         IF(J .EQ. ISAVE(12))
247
                  360
                        ISAVE(12) + J
248
                                    168
```

- 1

245	CALL NTERP (ACMG, TCMG, J, TALP4, 10, 1, TMACH4)	
250	370 IF(I .NE. IBAVE(11)) GB TE 380	
251	IF(K .EQ. ISAVE(13)) GA TA 390	
752	380 15AVE(11) 9 1	
253	ISAVE(13) e K	
254	CALL NYERP (ACLNR, TCMQ, K, TALPA, 10, 1, TMACH4)	
255	390 CONTINUE	
256	CLP * FUNCTION (ACLP, FMACH)	
257	CLD # FUNCTION (ACLD)	
258	CMG FUNCTIANTACMG, ABALP, FMACH)	
259	CLNR # FUNCTION(ACLNR, ABBET, FMACH)	
260	IF(ALPHA +LT+ 0+0) CN # +CN] CMCR++C	'MCG
261	IF(BETA .LT. 0.0) CY==CY; CLNCG=-	CLNCG
262	CMAD@C+	
263	CLNAD#00	
264	RETURN	
265	€ N C	

<b>v</b> 1	SUBRAUTINE TRSFER
ev #	C. *** C. *** CONTROL OF THE TRANSMENT OF THE TRANSMENT OF THE STATE O
•	
<b>9</b> 0	
•	
•	CORROLLOG/CPSI SOPII SOP
•	( + Oth ) Z 1 Set 1 Set S
01	CHITA COO (THIA)
دره انها	(マトエト) 21の中マトエトの
) <b>(</b> **)	
*	
10	Sec
1.6	POLIGE CHATA
	AFILOD * I CONTINU * I CONTINU * I TOD * AFILOD
20	
	<b>サードのも、このでは、またのも、このでは、またのものでは、またのものでは、またのものののは、またのものでは、またのでは、またのものでは、また</b>
O.R	MELEUD # MOOD # FILE MODE
100	E B B B B B B C D D I
25	
. E	RETURN
1	

+1 Eu	SUBROUTINE TREFERMS THE BODY TO SEEKER FOORDINATE SYS, TRANSFORMATION
en =	CIMENSIUM DUM(15) DUMR(+9)
*	COXTON/INTEG/IS USOUTS THINGS OF SOUTS
D <b>F</b>	BSIZESINCE
	BS22arcostrostrostrostrostrostrostrostrostrostr
•	BS31 aS1 v (THTAS)
C	GORGE CONTINUES (CONTINUES CONTINUES
) -	BS1148SS2≥€SS33
	TESS#ESSE##ESCO
3 <b>6</b> 71	88214=8512+8533
7	
<b>30</b>	8532€0•
3.6	RETURN
	Cit

1	SUPROLTINE TRSFBV
\$	E *** THIS SUBROUTINE PERFORMS THE BCS TO VCS FANGESTMATION
3	<b>c</b>
•	COMMON IN GAMP, GAMY, DELIVER, DELIVER, DELIZE
5.	COMMON/BIV/DELXV,DELYV,PELZV
6	BV12.SIN(GAMY)
7	BV22#C6S(GAMY)
8	BV31aSIN(GAMP)
9	BV33#C6S(GAMP)
10	BV1186V22+8V33
11	BV13**BV22*RV31
12	8721==8712=8733
13	8723*8712*8731
54	BY32*C*
15	DELXV#BV11*DELXTP+BV12*DELYTE+BV13*DFLZTR
16	DELYV#BVZ1*DELXTB+8V22*DELYT8#BV23*DFLZT8
17	DELZV@BV31*DELXTB+BV32*CELYTB+BV33*DFLZTB
18	RETURN
19	END

1 2 3		SURROUTINE LOSERR THIS SUBROUTINE TRANSPORMS MISSLE TO TARGET DISPLACEMENTS FROM ECS TO BCS, FROM BCS TO SCS AND COMPUTES LOS ERROR IN SCS
. •		The state of the s
5		C0PM6N/8T8/8511,8512,8513,8521,8522,8523,8531,8532,8533
6		COMMON/ETB/EB11,ER12,EB13,ER21,EB22,FR23,FP31,ER32,EB33
7		C6MMON/INP5KR/PITERR,YAGERR
5		COMMON/DEL/DELX, DELY, DELZ
9		COMMON/STUFF/ DELXS, DELYS, DELZS
1.2		COMMON/STUPPI/DELXB/DELYG/DELZB
10		DELX8#E811*DELX+E812*DELY+E413*DFLZ
1.1		DELYBWEB21*DELX+E822*DELY+E923*DELZ
12		CELZB#EB31*DELX+EB32*DELY+ER33*DFLZ
13		DELXS+BS11+DELXB+BS12+DELYB+BS13+DEL7B
14		DELYS.BSR1.DELXE.RS22.DELYB.BS23.DELZE
12	<del></del>	
16		PITERR#ATAN2(=DELZS;DELXS)
17		YAWERRUATANZ(DELYS,SGRT(DELXS-DELXS+DELZS-DELZS))
18		RETURN
19		END

'EM

THIS SUPROUTINE CALCULATES THE MACH NUMBER  CUINENSION RUP(63)  REAL MACH COMMON/ETE/EP11, FR12, FB13, FR21, FB22, FB23, FR31, FB32, FB33  COMMON/MACL/MACH, VSND, UR, VR, WR, VRS, VRW, VW COMMON/F/XS, WYS, WZS  COMMON/F/XS, WYS, WZS  COMMON/F/XS, WYS, WZS  VW=EB11=WXS=ER12=WYS  VW=EB11=WXS=EB22=WYS  VW=EB11=WXS=EB32=WYS  VR=U=UW VR=V=UW VR=V=VW VR=V=VW VRS=VR=VR=VR=WR=WR  VRS=VR=VR=VR=VR=WR=WR  VRW=SGRT(VRS) PACH=VRW/VSND PETURN PRO	•		SUBRBUTINE MCALC
## CIMENSION RUM(63) ### REAL MACH ### COMMON/ETE/EB11, FR12, FB13, FR21, FB22, FB33, FR31, FB32, FB33 #### COMMON/ETE/EB11, FR12, FB13, FR21, FB22, FB33, FR31, FB32, FB33 ###################################	څ	C***	THIS SUPRBUTINE CALCULATES THE MACH NUMBER
### REAL MACH  COMMON/ETE/EP11, EP12, EB13, EP21, EB22, FB23, FR31, EB32, EB33  COMMON/MACL/MACH, VSND, UR, VR, VRS, VRW, VW  COMMON/INTEG/I, J, GC; U, V, W, RUM  COMMON/F/XS, WS, WZS  CO  UNBEB11WXS*EB12***  VMBEB21****  UNBEB1*****  URBU-UW  VRSU-UW  VRSU-WW  VRSU-WW  VRSU-WW  VRSU-WW  REAL-WW  VRSU-WW  REAL-WW  RE	3	č	
COMMON/ETC/EB11,EB13,EB21,EB22,FB23,FB31,EB32,EB33 COMMON/MACL/MACH,VSND,UR,VR,WR,VRS,VRW,VW COMMON/INTEG/I,J,GG,U,V,W,RUM COMMON/F/NXS,WYS,WZS COMMON/F/NXS,WZS COMMON	4		
7	5		
### ##################################	6		
### ##################################	7		C6MM6N/MACL/MACH, VSND, UR, VR, WR, VRS, VRW, VW
	Ř		
11 VMREB21*WXS*EB22*WYS 12 WMREB31*WXS*EB32*WYS 13 UR*U**UW 14 VR*V**VW 15 WR*M**W** 16 VRS*UR*UR**VR*WR*WR 17 VRW**SGRT(VRS) 18 MACH**VR*V/VSNC 19 RETURN	ğ		COMMON/F/WXS, WYS, WZS
12 WkaEB31*WXS+E632*WYS 13 UR*U**UW 14 VR*V**VW 15 WR************************************	10		- UNBEETTANX SAEUTS
13	11		
14	12		Wk#EB31#WXS4EB32#WYS
15 WRWWWWW WROWN WROW WROW	13		tR∍U=UW
16 VRS#UR#VR#VR#WR#WR 17 VRW#SGRT(VRS) 18 MACH#VRW/VSNC 19 RETURN	14		VR*V•VW
VRW#SGRT(VRS)  18 MACH#VRW/VSNC  19 RETURN	-		hRahahn
TS MACHEVRW/VSND 19 RETURN	16		- VRS#UR#UR#¥R#VR#WR
18 MACHEVRW/VSND 19 RETURN	17		VRW#SGRT(VRS)
19 RETURN	_		MACHEVRW/VSND
			RETURN
			END

```
SUBPAUTINE FARMAN
                                                                                                         SUBRAUTINE FORMAN CALCULATED FARCES AND MAMENTS FOR THE DIFES & MARKUTINES
                                                                         C.
                                                                                                       COUBLE PRECISION TIME, TIME3

REAL MACH
CIMENSION HOMO(A), HOMI(17), WIHI(40)
COMMON/TODEG/XXE, AYS, AZO, CLO, CNE, ALD, AMD, AND, CMS
                                                                                                        COMMAN/COEF/CAZ,CY,CN,CLP,CMCG,CYCG,CLD,CMG,CNR,ALPHA,BETA,CMAD.
                                                                                                   1CLNAP
                                                                                                        COMPRESSERVACES AND CARCES AND ANGLAS AN
                                                                                                        COMMANYCONDELVY, CELVA, CELRA, FELROL
COMMANYJUNKYTIME, TIME3, AMA, S. D. SGUR, CAP, 10AP, RAPTM1, RAPTM2, IACT,
  ΙŚ
 13
14
18
                                                                                                   1 SLOPE 1, PT 1, PAPTMO, SLOPE P, BTP, CTT, CPT, SPT, XL TA, STT, GAPS, GAPS J,
                                                                                                   SCAPSCM, TH
                                                                                                       COMMANJINTEG/I,J,40MA,P,G,G,R,44MI,DEL1,CFLVF,NFL3,FIHI
COMMANJFFJFFCCBJFFCMBJFFGXBJFFXXBJFFXZBJFFXZBJFFXLBJFFXMB,FFXMB
 18
17
18
                                                                                                        ALPHARATANZ(RR,UR)
SGLW-SGRT(UR-UR-WR-WR)
 51
50
                                                                                                        BETAGATANZ (VR, SGLW)
                                                                                                        CAPT.5-RH3-VES
                                                                                                        CAPSOGAPOS
                                                                                                        GAPSC+GAPS+5
1F(VRK+EG+0+)88 T# 121
23
24
27
                                                                                 121 CONTINUE

122 CONTINUE

123 CONTINUE
26
27
                                                                                                        <u>CELAA41CEF7#CEF31AS4</u>
29
                                                                                                        CELVR . (DEL1+CEL3)/2.
                                                                                                   CELVAG(DEL14CEL3)/2.

IF (IACT+EG-2)/ELVY*(DEL3**DEL1)***

IF (IACT+EG-2)/ELVY*(DEL3**DELVR

CELR**GE+TIME3)/ELREC+OELVR

CELR**CELROCH**E3/*SAMACH**ALPHA**BETA**, CELVP**, DELVY**, CELR**, CMCG**CY**, CLCG**CAT**, CMCG**CY**, CLCG**CAT**, CMCG**CAT**, CMCG**CAT**,
30
31
32
33
35
36
37
                                                                                                       CAB . GAPSCH-CAR-R-FFCAR
38
                                                                                                      AXB - GAPS+CAZ+FFAXE
40
                                                                                                       AZB V VGAPBUCYOFFAZB
                                                                                                        ALB+CAPSDM+CLP+P+FFALB
                                                                                                      AND = GAPSD-CYCG-FFANB

ANB-GAPSD-CYCG-FFANB

IF(IRAP-EG-O-SR-TIME-LT-RAPTM1)GD TO 123

IF(IIME-LE-RAPIM2)TH-SLAPF1-TIME-BT1
42
44
                                                                                                      *8-
47
4.
49
                                                                                  123 AXB#AXB+TH*CTT*CPT
50
                                                                                                      AVB-AVB+TH-CTT-SPT
51
                                                                                                       AZB=AZB+TH#STT
                                                                                                      ATPONTOSTIONS
32
53
                                                                                                      AND AND THE CTTOSPT - XLTA
                                                                                                       RETURN
```

· Fan

1		SUPRALTINE DIFER
\$	C+++	SUBROUTINE DIFFE CONSTRUCTS THE EQUATIONS OF MATION
3		andere intelligible itale
*		CIPENSIAN DEGIZZATIONETZAL
5		HEAL MASSAIXATY7
6		COMMON/ETR/ER11, ER12, EB13, ER21, EB22, FR23, FR31, E332, EB33
7		
8		
9		
10		COLLONATINE
11		COMMON/JUNKI/THOI DATROLLAGAMAGGANA THE
12		
13		COMPONICUIOX8,GYR,GZR
1 A	Cen	GRAVITY RESELUTION TO BCS
15		GXB#FB13*G
16		GYBVERS3AG
17		GZ8#E833*G
18	C**	EGLATIONS OF MOTION
19		CL#AXB/MASS+R*V-C*W+GXB
20		IFITIME . LT. THOLD . AND . NAVY . EG . 1 ) CU = 0 .
21		CV+AYB/MASS+P+H-R+L+GYB
_55		DWBAZE/MASS+G#D=PAV=GZB
53		CP+(ALB+CLB)/IX
24		DGe (AMB+CMB)/TYZ+PeRexINTIA
25		DRa(ANB+CNB)/IYZ=PaG+XINTIA
26		CTHTAF(G#CPH1=R#SPH1)/CPS1
27		CPHI#P-DTHTA+SPSI
58		DPS1#R#CPHI+G+3PH1
29		IF (IROLL . NE. C)DP = 0.
30		IF (IRCLL+NE.C)P+O.
31	Cas	MISSILE VELOCITY IN ECS
35		CX=E311+U+E821+V+E831+W-
33		CY=EB12+U+EB22+V+EB32+W
34	····	CAREGIS-U-EB23-V-EB33-W
35		RETURN
36		END
		<del></del>

**\_'®** 

1	SUBPOUTINE METC	
à	CHA SUBROUTINE METO CALCULATER THE VELACITY OF GRUND	
3	C	
	COUBLE PRECISION TIME, TIMES	
Ř	CIMENSIAN DUM(SS), CUMY(6)	
6	REAL MACH	
7	COMMAN/MO/GEDALT, TO: TGRAD, RHOSL; ARG1, KTMAL, RSTAR,	
8	IRHOE, ARGZ, GO, TMEL	
g	COMMON/JUNK/TIME, TIMES, RHP, DUM	
10	COMM8Y/MACL/MACH, VSND, DUMY	
11	IF(GEMALT.GT.36089.2389) GA TA 12	
1 2	TMOL #TO #TGRAD#GE PALT	
13	RHO#RHOSL#(TO/TMOL)##ARG1	
14	RM88#RM6	
15	VSnD+SGRT(1+4+RSTAR+TM6L/wTM6L)	
16	G0 T6 13	
17	12 CONTINUE	
18	ARG2#=GB#WTM6L#(GE8ALT=36C89,2389)/(RSTAR#TMRL)	
19	RMO#RMOE#EXP(ARG2)	
20	13 RETURN	
21	END	

```
SUBROUTINE SEEK
                                                     THIS SUBRRUTTNE BETECTS TARGET WITHIN THE DETECTION RANGE OF SFEKER, TARGET WITHIN THE FIELD OF VIFW, S-A-W, SEEKER WITHIN LINEAR MANGE
                                                     COUBLE PRECISION TIME, FSTSAM, TIMEA, DT, DTA, TST, TMF, SPER
                                                     DIPENSION CAT(14), RAT(49)
                                                     COMMON/STUFF/DELXS, DELYS, CELZS
                                                   COMMANJUNKZ/SRNGE, IFUFA, IACO, RDFT, YAMERA, PITFRA, PMFOV, BA, RNGLIN, 1PITY 1530, R20, NULEKR, BRS, RFLECT, NLLL, KAGE
COMMON, IMPSKR/PITERR, YAMERR
70
                                                     COPPONITUNKITINE
11
                                                     COMPON/INTEG/I, J, DTRK, CAT, THTAS, THASD, PSIS, RAT
12
13
                                                      COMMON/TT/F9TSAM, TIME4, DT, DYA, TST, TME, STOR, TSAM, DO, JMAX, IPRINT, T2
                                                      SRNGE + SCRT (DELXS+DELXS+DELYS+DELYS+DELZS+OFLZS)
                                                     CATA TACGITOT
TETTE FERENCIAS TO SEC
ΊĒ
                                                     IF(TIME+LT+T2)GB T9 105
IF(TAC91+NE+0)GB T9 11
  10
   3*
                                                     IF ( TACB . NE . 1) GB TO 10
   4.
                                                     FETSAMUTIME
                                             10 IF (IACE+EG+2) IACG1+1
   5+
 -64
                                                     CONTINUE
                                                    GO TO (565, 107), TACG
18
20
                                                      IF (ACG+EG+2)69 TO 107
21
                                                     PRISAMUTINE
                                                     IF(TIME.GE.TIMEA)GO TO 565
28
                                                     TPITTPENETATINENIGS TO 105
53
                                     Como ACGUISTIBNIJACGOS) WHEN TARGET IS WITHIN SHERY AND ROET
24
25
                                          565 CONTINUE
86
                                                     LINEAR SEEKERAND OUTPUT WHEN OUT OF FOV
27
                                     Ca.
                                                     IF(SGRGE+GT+RDET)GB TB 101
IF(SGRT(YAMERR*YAMERR**P)TERR**P|TERR*++001*PHF8V)G9 TB 101
IF(SGRT(PITERR***2*YAMERR***2)*GT+0087266*)GB TB 101
28
29
31
                                                      IF ISORT (PSIS-PSIS-THTAS-THTAS).LT:BA100 TO 101
32
                                          567 CONTINUE
                                    CHANGE OF THE THE THE THE COURT OF THE COURT
33
34
35
                                                     OT HOTA
                                                     CTRK-SNGL (DT)
36
37
                                                      IACGUE
38
                                                      IPRILTO2
                                     PRINT 90005
90005 FORFAT(/,2%,14CQUISTIGN1)
39
40
41
                                          107 CONTINUE
42
                                                     KULL SEEKER
43
44
                                                     PITERRUATANZ(-DELZS/DELXS)
                                                      YAWERROATANZ (DELYS) SCRT (DELX8-DELXS+DELZS+ZELZS))
45
46
                                                    LOSS OF ACCUSTION
*7
48
                                                      IF (SGRT (PITERROPITERROYANERROYANERR). GT. PHESV) GO TO 101
                                                     PITYANGG=SGRY (PITERO-PITERO-YAMERO-YAMERO)
50
                                                     IF(PITYAW90.LZ.O.5/PED)MULSKR=2
31
                                          1C3 CONTINUE
52
                                                      <del>SAMPLE-AND-HOLD-IF-FSTSAMETIME-IS-INCLUDED-AFTER-STATEMENT-107-</del>
83
54
                                                      TSTOTIME - FSTSAM
                                                      TSAMOTSTOTHE
                                                     IF (TSAM-SPER) 104, 104, 104
                                          104 THEFTHEFER
57
```

58 39		IF (SRNGE+LT+BRS)GR TO 108 IF (SGRT(YAMERR+YAWERR+PITERR+PITERR) GT+PHFOV)GS TO 108
60		IF (SGRT (PSIS PSIS + THTAS + THTAS) . LT . BA) G9 TA 108
61		CALL SEEKER(SRAGE, RFLECT, PITERR, PITERR)
65		CALL SEEKER(SRNGE, RFLECT, YAWERR, YAWERD)
E 9		PITER8*PITERR .
64		YAWEROAYAWERR
65		G8 T8 109
66	101	IACG#NULL#KAGE#1
67	108	YAWEROWO .
68		PITER0 • O •
69	109	CONTINUE
70	Ċ	
71	Ea#	SEEKER WITH LINEAR RANGE
72		IF (ABS (YAWERD) . GF . RNGLIN) YA WERD &SIGN (RNGI IN . YA WERD)
73		IF (ABS(PITERO) . GE. RNGLIN) PITERO VSIGN (RNGLIN, PITERO)
74	105	RETURN
75		END

```
SUBRAUTINE EDSKROVAS
                                              THIS SUBMOUTINE CONSTRUCTS THE SPEKER GYR" MADEL FOR ED
   5
                                Ċ
   3
                                              COUBLE PRECISION TIME
                                             REAL KT, KT10, KT20, LAMPR, LAMPR
REAL KG, KT30
                                             LOGICAL FLGA/ TRLE . /
                                             COMPRESSINTEG/KUTTA, NX, DTRK, U, V, X, P, G, R, PUT, THTA, PSI, X, Y, Z, RTHTA,
                                           1RPSI, THTAS, THASD, PSIS, PSISD, OMEGA, TXFC, PXFD, PFF, YEF, DELL, CELVF, 2CELS, DDELI, DDELYP, DDEL3, RLAMY, RLAMP, RPHIG, DPHIO, DU, DY, DW, CP, DC, PR, DELS, DDELI, DDELYP, DDELS, RLAMY, RLAMP, RPHIG, DPHIO, DPHIO,
                                           3CPHI, CTHIA, DPSI, CX, DY, DZ, DRTHTA, DRPSI, DTHAS, DTHASD, DPSIS, DPSISO,
 10
                                            ACCHEGA.CTXED, OPXFD, OPEF, DVEF, DDELP1, DDELPP, ADFLP3, CDDEL1, CDUELP,
 11
                                           50CDEL3, DRLAMY, DRLAMP, DRPHIG, COPHIO
 12
                                             CGHABUNATINE
 13
                                             COMMON/TT/FSTSAM, TIME4, DT, DTA, TST, TMF, SPER, TSAM, CO, JMAX, IRRINT, T2
 14
                                             COMMON/DERY: . GV: 6MEGZ
COMMON/BOH/RSL,K ',KT10,KT20,LAMPR,LAMYR,RTM,RTM(N,R5GE,ED1,FLG4)
 15
 16
 17
                                            IRSAJFC4, CSA
 18
                                             C6MP6N/BT9/6511,8912,8913,8921,8922,8923,9931,8932,8933
                                           COMMON/JUNK2/SRNGE; IFUFF, IACG, ROET, YAMERA, PITERA, PHPOV, BA, RNGLIN, 1PITYANSG, R2D, NULSKA, BRS, RFLECT, NULL, KAGE
 19
 20
                                             CETHON/GPARARAHAAABAKTSO
 Te
 21
                                             CPHIO DPHI
                                             55
 23
  14
                                C. ... CHECK FOR NULL SFEKER
  2.
  30
                                             IPTTTPESOT SIDS SAND SATHALT SAYPINIGG TO BOOK
  ..
                                             IF (NULL . EG . 2) 08 T8 5000
  57
                                             NULUU1
                                             RSGE+SQRT(THTAS+THTAS+PSIS+PSIS); IF (RSGE+LE+0+5/R2D+AND+IACG+EG+2)
  64
76
                                        TAULLEZ
                               C++++ IF (SGRT (PITERR++2+YANERR++2) + GT+PHFOV) | AC3=NULL+1
  8+
 46
                                 5000 IFTIACGECTINULLT
109
                               C
11*
                                             IF (NULL . EG . 1) LAMPR . LAMYR . O.
120
                               C
7Å
25
                                             IF (NULL . EG+1)KY#KT20
                                             IF (NULL.EG.2)KT#KT10
                                             IF (ABS(RLAHY) +GT++87266+)RLAHY+STGN(+87266+)RLAHY)
26
27
                                             SMEGY * KT * PITERS
 28
                                             SPECZYKT TANERS
29
                                             IF (APS(@MEGY) +GT + + 1745329) 8MEGY +SIGN(+1745329, 5 VEGY)
                                             IF(A85(BMEG2)+GT++1745329)BMEGZ#81GN(+1745329,BMEGZ)
30
31
                                             LAMPROSMEGY
35
                                             <del>CAPYRVOPEGÉ</del>
                                             SEEKER GYRO FOR ED
45
                               ¢
46
47
                               5005 CONTINUE
                                             IF(YIME+LT+ED1)Gn TO 6670
4.2
49
                                             IF(+AAT+FLG4)G8 T5 6670
50
                                             <del>₭₳₲₭₻₴₮₣₶₲₦₻₮₦₲₸₮₣₵₲₮₮₽₽</del>₽₦<del>₸</del>₽₽₽₽₭
                               90004 FORMATI//2X, TUNGAGE GYRA FOR ROLL TO VERTICALLY
51
52
                               6470
                                            CONTINUE
                                             IF(TIME.GT.ED4.AND.1ACR.NE.2.AND.17UF8.NF.2)KAGF-1
53
54
                                             IF ( IACG. EC. 2) KAGF+2
-
                                            Q5A48521*F+R522*5+8923*R
56
                                            <del>46x>E531+F+8832+C+8933+R</del>
57
                                            GO TO (5200,5201), KAGE
58
59
                                            CAGE
60
```

<del>4</del>	5201 C	G9 T8 (5202,5204), IACG
<del>5</del> 4	C C	LNCAGE
7		FRFE GYRU
a a	C = 202	CTHTAS==QSA/CBS(PSIS)
9 0	5202	CHSISTERSA
1		GB TP 5203
ກ	C	017 - 614
3 4	C C	THACK
F	5204	CTHTAS=(BMEGY+QSA)/CBS(PSIS)
<u>Ÿ</u>		DPSIS*ONEGZ#RSA
7 ዶ	F203	RETURN
	<del></del>	

1		SUPROLTINE EDAP
· <del>ż</del>	*C##	THIS SUBMOUTINE CONSTRUCTS THE ALTOPILOT MADEL FOR ED VERSION
3	•	DOUBLE PRECISION TIME
<del></del>		LOGICAL FLOIY,TRUE, /; FLOZY, TRUE, /; FLG3/, TQUE, /
5		COMMON/JUNK/TIME
6		C8PM8N/S8/81,S2/S3,S4,S8/86
7		REAL POLES(01)/+20./
		REAL KPDJKQJKMJLAMBIJLAMPRJLAMYR,KG
5		
9		COMMON/OUTAP/YEG, REG, PEG
10		COMMON/BON/ ISLAKTAKTIOAKTZOALAMPRALAMYRARIMARINARSGE/EDIAMLG4/
11		1884/ED4/USA
12		COMMON/JUNKZ/SRNGE, IFUFR: IACQ, RDFT, YAWERS, PITFRS, PHFOV: BA, RNGLI",
13		1PITYANSG, R2D, NULGKR, BRS, RFLECT, NULL; KAGE
<u> 14</u>		COMMON/ARROW/PHIG,FLG1,FLG2,FLG3,REF,RFL,YFD,PED,TMRBS,PSRBS,
15		1THBS,PSBS,GBLV,PEFL,KPD,KG,KM,KG,LAMBI,PALFS
16		COMMON THIS CONTRACTOR OF THE
17		1RPSI, THTAS, THASD, PSIS, PSISD, OMEGA, TXFD, PXFD, PEF, YEF, DEL1, DELYP,
18		2DEL3, DDEL1, DDELYP, DDEL3, RLAMY, RLAMP, RPHIG, DPHIO, CU, DY, DW, DP, DG, DR,
19		3CPHI, DTHTA, DPSI, DX, DY, DZ, DRTHTA, DRPSI, DTHTAS, CTHASD, DPSIS, DPSISD,
20		ACOMEGA, DTXED, DPXED, DPEF, DYEF, DDELP1, DDELPP, DDELP3, DDDEL1, CDUELP,
21		5DDDEL3, DRLAMY, DRLAMP, DRPHIG, DDPHIO
22		COMMONS TOPESTSAMATIMENADIADTAATSYATMESSMERATSAMACOAUMAKAIPRINTATE
23	Ę	ROLL AUTOPILOT
	τ	
25		IF(TIME+GE+ED4)GB TB 5025
76		"PHIGHTOPHICOSIO75. HPGISOSE"
27		G0 T0 5030
28	2012	1FT1FUF0+E0+2108 TO 5025
29		IF(IACO+EC+2)GD TO 5025
10	•	PHIGO-DPHIG-51-75. +PSIS-32
31		90 T8 503C
35	5025	TF(*K8T*FL91)08 T8 6667
33		PRINT 90002; IPRINT+2; FLG1+N9T+FLG1
34		FORMAT(//2X, MOLL HOLD!)
35	6667	CONTINUE
16		DRLAMY#10.#DPHID
37 35		PHIGH-DPHIO-S1-RLAMY-83
39	č.	LEAD LAG ROLL AUTOPILOT REG/PHIG-KPD-(S-5)/E-12-5)
- <del>• • • • • • • • • • • • • • • • • • •</del>		CONTINUE CON
41	3030	CALL FLTR(PHIG, RPHIG, DRPHIG, REG, 12,5,5,4PD)
42		RFL #74/REDJ 1F(ABS(REG)+GT+RFL)REG#8(GN(RFL, RFG)
43	C	Talentin in the state of the st
44	C*4	PITCH YAW AUTOPILOT
45	C.	RATE DAMFING OF GIMBAL ANGLES THRBS/THTAS=KG+S/(+0067+5+1)
-11		- CALL EDATOAMPTTHTABYTXEDYTTXEDYTHABSYPOLEG(O()),KC,KM,THOO)
47		CALL EDRTDAMP(PSIS, PXED, DPXED, PSR8S, POLES(01), K2, KM, PSBS)
48	c	INPUT TO GUIDANCE FILTER PED, YED
49		CONTINUE
-50	5005	PEDULAHPR
51		YECOLANYR
50	-C++	- <del> </del>
53	-	CONTINUE
34	24.3	CALL FTLG(PED, FEF, DPEF, KG, 10.)
55		CALL FTLG(YED, YEF, CYEF, KG, 10.)
56		PEFL#PEF+LAMBI
57		GBL V+8+/R2D
-58		-1F(ARS(PEFL)+GT+GBL+)PEFL+S1GN(GBL+)-PEFL)
59		IF (ABS(YEF) .GT.GBLY) YEF +SIGN(GBLV, YEF)
60		IF(TIME*LT*TZ*GR*IACG*EG*1)98 TO 5100
61		1F(+NOT+FLG2)GO TO A668
62		PRINT 900C3; IPRINT=2; FLO2**NOT*FLO2
<b>-</b> €		TOTAL SAGARA, UTD. ACT. FROMADOLATOR

63	90003	FORMAT(/,2X, !LATERAL ENABLE!)
64		CONTINUE
65		G8 T8 (5080,5085), NULL
66	5080	PEG9(PEFL+THBS#56-YHRBS#54)#55
67		YEG#YEF+P8B\$#\$6=P\$RB\$#\$4
68		G8 T8 5100
69	5085	IF ( • NOT • FLG3) GB TO 6669
70		PRINT 90004; IPRINT=2;FLG3=+N6T+FLG3
71	90004	FORMAT(//2X, IGUIDANCE ENABLE!)
75	6669	CONTINUE
73		PEG#(PEFL#THR8S#S#)#S5
74		YEG@YEF#PSR85#S#
75	5100	IF (ABS(PEG).GT20943948)PEG.SIGN(.20943948,PEG)
76		TF(ABS(YEG).GT. 20943948) YEG. 61GN(.20943948, YEG)
77		RETURN
78		END

1	SUBRAUTINE FLTR(X, Y, Z, A, B, C, D)
>	Saxabal
7	A#(C#Y+Z)#D
4	REYURN
<b>E</b>	ĔνC

1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	SUBREUTINE EDRIDAMP(X,Y,Z,A,B,C,D,E) Z=B*(C*X*Y) A=B*(C*X*Y)
4	E#C#(X+A)
<b>x</b>	RETURN
4	FND

1 P 3	SURRBUTINE FTLG(X,Y,Z,A,B) Z=R+(A+X+Y) RETURN	
4	ENC	

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ģ	C+++ THIS SUPROUTINE CONTAINS THE CONTROL SYSTEM, CAMARDS FOR EACH PLANE ON
ຳ	C COMMON SHAFT, SECOND ORDER ACTUATOR MODEL
	CIPENSION ACTION / AC
R	COMPRAJUNKZ/SRAGE, IFUFF, TACG, ROFT, YAWERS, PITFRS, PKFOV, BA, RNGLIN,
6	1PITYANGGIRZO, NULSKR, BRS, RFLECT, NULL, KAGE
7	COMMONICATIVE OUT OF THE COMMON
Å	COMMON/INTEG/IJJXCT, DEL1, DELVP, DEL1, DDEL1, DDFLVP, DDEL3, ACTO,
9	IDGELPI,ODELPP,ODELP3,ODELI,DODELP,OCCEL3,ACTR
.le	COMPENYJUNKYTHE, TIMES, RME, S, D, SCOW, GAP, THAP, RAPTYLY RAPTYLY RACTY
P.	islapei,bti,raptm3,slape2,at2,ctt,cpt,spt,xlta,bt7,gaps,capsu,
3•	2GAPSCP, TM
10	ODDEL1=60.*(A0.*(YEG=REG=DEL1)=DDEL1)
11	DDDELP#80.4(50.4(PEG-DELVP)-DDELVP)
12	DDCEL3*60.*(60.*(-YEG-RFG-DEL3)-CDEL3)
43	1717C1*6625100C6F1A80*4(80.4(460-460-460-460-460-460-460-460-460-460-
14	1F(IACT+EG+2)DDDFL3+60++(60++(REG+YEG+DEL3)+D*EL3)
15	OCFLP1*CDEL1
16	OCELPPODELVP
17	DCFLP3*ODEL3
18	RETURN
19	END

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ALLAST (FILE, Y1); (FARMAT, U); (RSIZE, 202); (FSIZE, 100)
ALLART (FILE, X2); (FARMAT, U); (FSIZE, 202); (FSIZE, 100)
ASSIGN (MISI, RT, X6)
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ALART (TEMP, ECC); (LIP, USER, SYSTEM)
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Appendix B.

CSSL PROGRAM - DYNAMIC GYRO MODEL

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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   TFINE TO
                                                                                                                                                                                                                                                                                                                                                                                                                                                             FRAGRAM
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             INITIAL
                    CSSL
```

(Ca)

```
CONNECT (PZ6E, RT9L)
 CND
 SLERGUTING RTSL
       C9MM4N/ZC004/Z0004(58)
       CAMMON/ICCC4/RMYU, RMY, RMPU, RMP, H, A, RR, PSIS, A, RB, THTAS
       EGLIVALENCE (20004(4), DPSISO), (20004(3), 20000), (20004(18), PSISO), (
      123004(17),20001),120004(32),DTHTASD),(20004(31),20002),(20004(46),
      2THTASD) . (ZO^04(45) . ZOCO3)
       EXTERNAL GYRB
99997 7999540.
       NST#256
       CINT#1:0
    TeC.0
       IALGER . 5
       JALG8R#5
       10000C+0#TAIMH
       NIST .1
       TTER#2
       ZCCC4(1/1)=0.
       20004(88)00.
       Z00C4(42)=0.
       20004(56)=0.
       :H# + 0921875
       A . CO27083
       B . . C G 3 2 G 8 3
       RR#.C0017192
       RB**00017192
       THTASEPSISOD. .
       TFIN-10.
       CALL Z9998(4, Z0004, GYRO, NST, CINT, T, D)
199999 CONTINUE
       IF (T-TFIN) 90000, 90000, 50001
- 90000 CENTINUE
       PRINT 90003,T
90003 FEPMAT (618X, E12.51)
90002 CENTINUE
PRINT GCCO5, DPSISD, DTHTA8D, PSISD, THTASD, PSIS, THTAS
9CCC9 F9RMAT(6(8X, E12+5))
.90004 CENTINUE
       CALL Z9999(4, Z0004, GYRB, NST, CINT, T, IALGER, JALGER, HMINT, NIST, TTER, I
    , LERR)
       Z9995#1#
69 TA 99999
99998 CONTINUE
 90001 CONTINUE
       STEP
       END
       SUBRAUTINE EVRE(T)
       C8MM8N/ZCCC4/Z0004(58)
       ECLIVALENCE (ZOCO4(4), DFS[SD], (ZCOC4(3), ZCOCO), (ZOOO4(18), PS(SD), (
      120004(17),2001),(20004(38),DTHTASO),(20004(31),20002),(20004(46),
      2THT/SD), (ZOOC4(45), ZOCC3)
       COMMAN/Z0004/RMYUARMY,RMPUJRMP;H;A;RR;PSIS;8,RB,THTAS
       RMYL#STEF(C.,T)
       RMY0 . C15625 + RMYU
       RMPL=STEP(0.1)
       RMF# . 015625#RMPU
       PSISC*ZCCCO
       PSIS.ZCOC1
       THTASU.ZCCC2
       THTAS=ZCC03
```

```
CPSISD==THTASD+(F/A)=(RP/A)*PSISD+(RMY/A)
CTFTASC=PSISC+(H/B)=(RB/B)*THTASD+(RMP/B)
RETURN
END
TTF* 0
EBF 9TASC
TAL J9B TIME=OC:C2:10
```

\*\*\*FIRST PASS DONF\*\*\* MACRE . INVSKING FROGRAM MACRE INVSKING INITIAL INVEKING DYNAMIC MACRA INVEKING BUT MACRE MACR5 INVAKING BUT INVEKING TERMINAL MACRO ###S:COND PASS DENEM## \*\*\*THIRD FASS DONE O EPRORS\*\*\*
\*\*\*FOURTH PASS DONE O ERRORS\*\*\* ###FIFTH PASS DONE### " \*\*\*SIXTH PASS DONE \*\*\*

•						
477 94A8013						
2010	Sit.					
LOAD GO (TEMP, 400) / (	II TEJ DSERJSYSTEM), (4. 11	;				
ADING WAS COMPLETED	d	· · ·	· #		, ^S,	6
<b>,</b> ⊢	-	:	•		• •	
0	• 4970PE 01		c .00000E 00	. OO BOOOD.	٠.	000000 00
10 300001	. 38403E 01	** JS861E-01	-,94367E-08	16948E 00	٠., ٠	.17084E 00
10 30000x 01	. TO 316632.	-,7C711E=01	13886E-01	-+33878E 00	"'}}-`	•34164E 00
0000000 000000000000000000000000000000	10 38881 •	**************************************	** £37;6E*01	**B0792E 00	<b>.</b> -	*51240E 00
4-4 1-4	. 00 380986.	* 13 8 8 4 E 00	95200E-02	67691E 00	•	.68308E 00
。 (1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	•18270E 00	16314E 00	**************************************	84579E 00		* 85363E 00
• 60000E 01	**************************************	1884NE 00	*8 * 40 E = 02	10146E 01		*102+2E 61
.70000f 01 .80374E 01	••11796E 01	ZIOSOE OO .	. #1896E-01	*,11828E O1		11941E D1
。 800000円 01 10 10 10 10 10 10 10 10 10 10 10 10	17181E 01	00 38865°1-	. 36781E-01	13510E 01		.13640E 01
. 39819F 01	10 36896 01	2045%E 00	, 42948E=01	**15191E 01		+15338E 01
の の の の の の の の の の の の の の	** 25032E 01	2564RE 00	,69986E=01	16872E 01		.17035E 01
187 0			X			
IN TAL JAB TIME BOCKCOKA7	-					
-	**					

Appendix C.

6-DOF DIGITAL MISSILE TRAJECTORY SIMULATION WITH DYNAMIC GYROSCOPE MODEL

\_ 'M

PISCILE TRAVECTORY SIMULATION WITH A DYNAMIC GYRAGCEDE VOCEL		
DYNAMIC	ı	
A WITH A		
SIMPLATIF	1950), SAVE	
RAUFCTARY	4 L PAT (FILE) XAT, (FBPWAT, C), (FS12E) 1950), SAVE	
F ISCILF T	(FBONAT,C	
F, CIGITAL	(FILE, XA)	
CAB ARAF, CIGITAL	410112	TTAUD!

* * U	AERACYNAMICS AS AT 12/20/72 AND MEASURED SEEKER PERFRA-	AS AT	12/20/72	AND	MEASURED	SEEKER	PERF94
2 ***	MANCE DATA AT 12772.						
_	EXTFRNAL DERIVATIVES	ហ					
	CALL INITIAL (1S, DERIVATIVES)	RIVAT	VES)				
'n	CALL RUNGK						
1	CALL FINISH	:	1				
_	GB TB 2						
,	END	1	1				

```
S U B R 6 U T I N E I N I T I A L (ETRUNCERIVS)
TOBUBLE PRECISION DIVESTSAM, SPER, THE 1, TIMED, TIMES, TIMES,
                       ITIMEA, TST, DTA, TIME
                        REAL KPRIKHIKCIKTIKTIOIKTEO
                        DETH JABR
                        REAL KB,KGL,KP
                        REAL KG,KRGL,KG,LAMPP,LAMYR,LAMET
                        REAL LP, KOJKS, KA, KS, KR
                                                                                                          WILL
                        REAL MACMAMAGS, IX, IYZ, IT, IA
                        MEAL XBA(33); XBB(33)
COMPON/INTEG/KUTTA, NX, DTRK, U, V, N, P, S, R, PH1, THTA, PE1, X, Y, Z, RTHTA,
10
                        1RPS1, THYAS, THASD, PS15, PS15C, OMEGA, TXFO, PXPD, DFF, YEF, DEL1, CELVP,
                       2DEL3,CDEL10DELVP,ODEL3,RLAMY,RLAMP,RPM10,DPM10,CU,DY,DM,CP,CC,DR,
3DFM1,CTMTA,DPS1,RX,DY,DZ,DRTMTA,CRPS1,DTMTAS,CTMASD,CPS19,DPS1SD,
ACGMEGA,CTXED,DPXFD,DPEF,CYEF,CDELM1,CCELPP,CDELM3,DDDEL1,CDWELP,
13
1 4
                        SCCCELS/ORLAMY/CHEAMP/CRAMIG/COPHIS
15
                        C0PM6N/ET8/E811,E812,E813,E821,E822,F823,F831,E832,E833
16
17
                         COPPEN/ETS/8511,8512,8513,8521,8522,8523,8531,8532,8533
                        COPPONITOCICPSI, SPSI, SPHI, CPHI
18
                        COPPONT INT GAMP, GAMY, DELXTB, DELYTB, DELZTR
15
                        COPPON/ETY/DELXY, DELYY, DELZY
20
                         COPMONIDELIDELX, CELY, DELZ
M
22
                        COMMON/STUFF/ DELXS, DELYS, DELZS
                        COPPRE/INPSKR/PITERR, YAWERR
17
94
                        COPPOR/MACL/MACH, VEND, UR, VR, WR, VRS, VRW, VV
                        COMPER/F/HXS. WYS. WZS
34
                        COMMON/COEF/CAZ,CY,CN,CLP,CMCQ,CYCG,CLD,CMG,CNR,ALPHA,BETA,CMAD,
24
27
                        COPPOR/TODEG/AXB, AYB, AZR, CLP, CNB, ALB, AMB, ANB, CMB
27
                         COPPAK/DD/DELYT, DELYR, DELR, CELROL
                        COMMANJUNK/TIME, TIMES, RHA, S, D, SGUW, GAP, 19AP, RAPTM1, RAPTM2, IACT,
30
                       ISLOPET, BT17RAPTH3, GLOPE2, BT2, CTT, CPT, SPT, XLTA, STT, GAPB, GAPBO,
31
                       2CAPSCM, TH
12
                        <del>COPPRINTER/FF/FFCLOJFFCMBJFFCMBJFFAXBJFFAYBJFFAZBJFFALBJFFAMBJFFANB</del>
13
                        COMPAN/GG/GXE/GYE/6ZB
34
                        COMMON/JUNKI/THOLD, IROLL&G, MASS, IX, IYZ, XINTIA, NAVY
35
                        COMMON/MO/GEDALT, TO, TORAD, RHOSL, ARGS, HTMOL, RSTAR,
36
                       IRPER, ARGE, GO, THEL
17
                        COMMON/TT/PSTSAM, TIME4, DT, DYA, TST, TME, SPER, TEAM, CC, JMAX, IPRINT, T2
38
                        COMPON/JUNK2/SRKGE, IFUFA, TACG; RCET; YAXERO, PTYFRO; PHFOY/GA; RNGLIM;
39
                       1PITYAHSCAREDANULSKRABRSARPLECTANULLAKAGE
40
                        COMMON/BON/RELAKTAKTIOAKTEO, LAMPRALAMYRA 97M, RTMINARSGE JEDIAFLG48
41
                       IRSA, ECA, GBA
47
                        COPPON/PERY/OPEGY, 8"EGZ
43
                        COMMON/OUTAP/YEG, REG, PEG
44
                         <del>COMPRK/ARROW/PWIG/PLO1/PLO2/PLG3/REF/RFL/VEC/PEG/THR89/PS</del>R<del>86/</del>
46
                       1THBS, FSP5, GRLV, PFFL, KPD, KG, KM, KG, LAMBI, PALFS
47
                        COMMON/55/51,92,53,54,55/56
                        COPPRA/CP/RB, RR, P, A, B, KT30
 1.
                        COMMON/STUFF1/DELX8,DELY8,DELIS
 3+
                 C
                        DICTIONARY-
 5.
 6*
                 Ċ
                        AERO
                 2
                        ALPHA
 .
 9.
10.
110
                 12.
                        ALTOPLY
19.
140
```

(#• (8	c c	
9	C CEFALLT VALUES	
50 51	GEAL GEAL (206)/	
52	1+2.896600C00E+01,+5.186880000E+C2,+3.217474000E+C1,	CC1C
33	2-3-566160000F-031+2+085553150E+C71+2+3769000000E+031	004G
5 &	3+9.971962570E+04.45.31200000E+00.44.488650000E+00.	0070
3 15	4+2+C1000000E-C1;+5+72300000E+CC;+5+08300000E-C1;	0100
8	545,00000000000000000000000000000000000	C13++?
37	6+6,0000000000,+00,+00,000000000,00,00,000000	0160
58	7+4,000000000;+00,+8+0000000000;±01,+0+0+0000000000	0190
39	8+1,50000000E+C1,+8,000000000E+C2,+6,000000000000000	C55-+U
G	9-1,-9250000CE+02,-4-00000000C+0C;+6-25C0000CE+0C;	025**0
11	A+2,500000005+02,+2.500000000E+01,+2.00000000E+00,	028C
2	F#1,C0C0CC00E#02,#1*00000000E#20;#0,00C0000000C2#0C;	
3	C+C+CCC000000E+003+5+000C0C00E=013+1+50000000E+013	0340
4	0+1.cocooooceoc.+1.cocoocoooc+co.+1.cocooooc=+co.	0370
5	E+1.00000000E+C0.+1.0000000000 +00.+1.000000000E+0C.	040+=0
6	#+1.0000000000000.+1.0000000000000000000	043==0
7	G+1,00000000000+00,+8+0000000000+00,+1+500000000000000+01;	046C
R	**1*800000000E*01**7*500000000E*00**5*0000000005E*007	
9	1+6.00000000E=02.+2.3528C0000E=08.+1.62260000E=05.	C52==0
Ċ -	J+2;CCC000000E=01;+1;5000000000000000+1;250000000E+01;	0550
1	K+1,250000000E+01,+1,500000010E+C1,+2,0000000E+01,	0580
ę	L-3,00000000E+02,+1,00000000E+01,+0,0000000E+00,	0610
3	M+1.00000000E=01,+6.000000000E+00,+3.14000000E+02,	064C
*	N+2+CC0000C002+03++1+2+5C00000E+03++0+0000C0CCCE+00+	
5	6+C,00000000E+00,+00.0000000F+00,+0.00000000E+0C,	070C
6	P+0,00000000E+00,+0;0000000000E+00;+2,83000000E+01;	0730
7	G+C,0CCD0CCD0E+CC,+C,0000CD00E+CC,+0,0000000CE+OC,	0760
8 -	- R+4,0000000E+03,+0+00000000E+00,00000000000	079==0
9	5+C.CC0000000E+00,+0+000000000E+0C,+0+0+00000000E+0O;	082**0
0	7 <del>00,0000000000000000000000000000000000</del>	0850
1	U+C.00000000E+0C.+0+000000000000000+0C.+00+0000000000	088==0
<b>2</b> –	V+0.00000000E+00.+0.0000000000000+0.00000000	091+-0
3	w+C,C0C000C00E+00,+0+00000C00E+C0,+0+0+0000000E+Q0,	094==0
•	X+G:00000000E+00;+0:00000000E+00;+0:00000000E+00;	0970
6	Y+C,00000CO0E+00,+2+112244897E+02,+5.25COOnCOCE+02,	1001
8	<del>Z+017266000002=031+1+00</del> 600 <del>000002+0</del> 01+0+0+000000000£+001	<del>103++1</del> +
7	1+0,0000000000000,+0,00000000000000,+0,000000	106**1
8	2+C.CCCCCCCE+00,+0+C00000000E+C0;+0.C0000000CE+00;	1091
•	3+G.00000000E+00,+0+0000000000E+00,+0+00000000	1121
0		1151
1	5+0,00000000000000000000000000000000000	1181
5	5+0+000000000+00++1+25000000000000000000	1211
3	5+C+00C00CC0E+00,+0+0000CC0C0E+C0,+0+000000CQ0E+00.	123**1
4	-5+G+00000000E+00x+0+0000000E+00x+00+00000000	1601
ę.	5+C,00000000E+00,+0,00000000000+00,+0,00000000	1291
6	5+0,000000000£+0c,+0+0000000000000+00;+0+0000000000E+00;	1321
7	5+0±00000000±4000;+0+00000000000±400;+0+0+00000000±400;	1351
8	5+0+0000000000000+00x+0+00000000000000+00x+0+000000	138-+1
9	5+C.C00000000E+CC,+O.C0000CCOCE+CQ,+O.COCCCCE+CQ,	1411
?	5+0.00000000F+00,+0.00000conog+0c,+0.000000000E+00,	1441
1	5+C.C00C00C00E+OC,+0.000C070C0E+CC,+C.00C700000E+OC,	1471
?	5+G,C0000000E+00,+0+00000non0E+00,+0+000060000E+00,	1501
:3	5+C.00000C000E+0C,+C.00000^000E+00,+0.00C0000CE+00,	1531
*		
5	5+C,C00C0CLJ0E+00,+0.0000C0030E+C0,+0.00C0A0CACE+00,	1591
6	5+C.00000000E+00,+0.000000000E+00,+0.00000000E+0C,	16216
7	5+C.00C00C00F+U0,+0.0000D000E+C0,+0.00U000C00E+00,	1651
8	5+C,000000000E+00,+0+00000000CE+C0,+0+00000000E+00,	16817

```
109
                                                                                                                                                                   171-+173
                                                                                                                                                                    174--176
110
                                                                                                                                                                    78--180
111
                                                                                                                                                                     80am188
TIZ
                                      5+C.0000000000E+0C,+0.0000000000E+C3.+0.00C0000000CE+CC)
113
                                      183--185
114
                                     5+C.COCOOCOOE+OO, +O.OOOOOCOE+CC.+O.OOOOOOCCE+OO,
                                                                                                                                                                   18600188
                                     5+C.00000000E+OC.+0.0000U0000E+CC.+0.00000000CE+CC.
115
                                                                                                                                                                   189--191
                                      54C.00C0C0C0CE400,+0.C000CC000E+00,+0.Q000000QCE+0C,
                                                                                                                                                                   192--194
116
117
                                      5+C.COCOOOOOE+OC.+8+0000000000002+03,+6.00C000000E+OC.
                                                                                                                                                                    196--198
118
                                      5<del>44.300000000E+C0,+6+500002000E+00}+1-02000C000E+01</del>>
                                                                                                                                                                   199---
                                     5+1.440000C00E+01,-4.0000000C0E+C3,+1.00C00000E+03,
119
                                                                                                                                                                   202--204
                                     10
                                                                                                                                                                   205--206
181
                                       COLELE PRECISION DOUBLE (CO1)/
                                     1+C.00CC00C00D+00/
155
183
                                        INTEGER FIXED (030)/
                                      1<del>+CCCOCO3O1+7+CCCO0000007+00+00+00000027+000000030207+C0</del>09300<del>128</del>7
124
                                                                                                                                                                   001--005-
                                     198
                                                                                                                                                                   006--010
126
                                                                                                                                                                   011--015
127
                                     016--020
128
                                     021--025
                                     129
                                                                                                                                                                   026--030
130
131
                                       LOGICAL LOGICAL(008)/
                                     1.TRUE +, PALSE+, PALS
112
133
TTO
135
                                     BXT, YT, ZT, VXT, VYT, VZT,
                                     CPMFOV; YMPOV; THTAC;DT;DTA;CQ;PASS; TX;TY2;S;TMF;BRS;DELRQL;KB;KQ;
DKG;KRQL;BD;BF;BQ;AF;BA;CG;KP;QC;KQL;GAMLB;PCL;YCL;CI;IT;IA;GF;
111
137
138
                                     ECLC, ANGLIN, DELMX, DELMY, VRATE, KA, KS, FBON, KS, RVBIAS, BRS, PHIMAX, IROLL
                                     F,RTCL/S1/S2,S3/S4/S5,ISKR,IROLLDC,IACT,IACG,IPRINT,UMAX,IRAP,
GTMETAT/P817,SLOPE1/SLOPER,GT.1,GT2/XLTA/RAPTM1,RAPTM2/RAPTM3
M/TB/TO/TO1/TO2/TO3/TO4/TO5/TO5/TO5/TC7/T1/T2/NULL/IFUFO/IQUIDE/T1P1/
133
147
141
                                    143
144
                                     MFFANE, FULL, THOLD, NAVY, KT30, KG
   1.
                                      REAL PDAC(181/1440+/;PBLES(011/
146
                                    147
148
149
150
151
                                       CATA T8, TC/-6, 1C./, KT, KT10, KT20/20., 10., 20./
192
                                       CATA 51,52,93,54,95,96,67,58,99,910,911,919/01-,1-,3--1-,7-1-/
                                      DATA SLUPE1.5LUPE2/36.7346938.-11.53846154/.xLTA/1.666667/
DATA RAPTM1/RAPTM2/94PTM3/1/6/6/5/13//
DATA REP/5:7255775515:001/.D29/.01745929/
153
130
133
                                       CATA RB, RM, M, A, B/2 == 00017192; +0921875; +00008418; +C0009972/
156
                                       CALL ABORTSET(99995.1)
                                                                                                                                                                      HH1074
                                       CALL EDFEET (99988, LUNIT)
157
                                   1 CONTINUE
158
                                       <del>CALL HYEL18</del>
139
160
                                       CALL MODE( TRI)
161
                           ×
                                       CALL PODE( C+)
162
                                       C6 1734 1=0,15000
                                      CALL HOACS(0,16,PDAC)
161
164
                           1234
165
                                 PASS ADDRESSES AND INITIALIZE LIBRARY RUNGE-KUTTA INTEGRATOR
167
148
                                        CALL RUNGKI(DU,L,DT,TIME,X+A,X88,NX,DERIVS)
                           c
```

170 C	INDUT VALUES		
177	GATE (CC1) . RST1 GATE (OC2	) e RST, GATE(003) e RST, GATE	(004) # PST
173	GATE (CCS) W RST1 GATE (COS	TERSTI GATE (COT) & MST	
174	TIME • DRUBLE(CO1)		
175 176	NX U FIXED(001); NUI		******
170 177			******
72	KAGE • FIXEC(007); NU		
79	- KAVY FIXE0100911 161		·
180	IFLFE FIXED(011); IR		2200000
181	ISKN # FIXEC(013); IR		*******
182	TACT . FIXED (015) J IR	PLLDC . FIXED(016)	******
183	IACG # FIXED(017); NU	L * FIXED(018)	••••••
184	KAGE # FIXED(019); 10		
189	ICC. A PIXECIOSIII IO		
34	ICUT . FIXEC (053) 1 IC		******
187 " 188	10LM # F1XEC(025); 10:		******
89 -	10LM # F1XEC(027); 10t		
90	FLG5 + LOGICAL(001)		
91	ERNOR	- PACI - LOGICAL (OUR)	
92	WINGL . REAL(001); TR	• REAL (002)	
93	00 T REAL(003); TOR		
194	FO FREAL(005) RHOS		
195	ROTAR TO REAL(007); CO	# REAL(OGR)	
36	MASS • REAL(009); IX	• REAL (010)	
97	TYZ V MEALTOITIT O	# REALIOIST	
98   <del>9</del> 9	RFLECT + REAL(013); PI	# REAL (014)	
100	WACO TO REAL(015); RE- FSYSAM TO OBLE(REAL(017))	# REAL (016)	
101	FITSAM # DBLE(REAL(017)) DELROL # REAL(019); LAME		
202	KB • REAL(C21); KG	II W REAL(020) W REAL(022)	
203	KG REALICESTI - KRGL		·
204	BC . REAL(C25); RVB)		
:09 <del></del>	8F - REAL(027); 80	# REAL (OZA)	
104	AF # REAL(CE9); BR5	# REAL(030)	
107 -	PHIMAX TO REALICALLE RYOL	# REAL (032)	
08	BA TREAL(033); CS	# REAL(034)	
109 210	KGL # REAL(037); FFCL	# REAL (036)	· · · · · · · · · · · · · · · · · · ·
?10 ?11	FFCFE # REAL(037); FFCN		
12	FFAXE B REAL(041); FFAX		
13	FFAZE REAL (043) + FFAL		
14	FFAMB # REAL(CAS); FFAN		~
15	GANLE		<del></del>
116	YCL # REAL(C49); THTA		
17	GF + MEAL (OS1) + CLD	2- REAL (052)	
18	IA # REAL(053); IT	# REAL(054)	
19	KD + REAL (055) + RNOL		
50	PHFOV - REAL(057); YHFO		
55	VRATE # REAL(059); DELM		<del></del>
23	VRATE # REAL(061); K4 K5 # RFAL(063); FEGN	• REAL (062)	
24	K8 # REAL(065); 8ME9	# REAL (064) A # REAL (066)	
ž.	PCA + REAL(067); U	A # REAL(066) # REAL(068)	
56	V • REAL(C69)1 W	9 REAL (070)	
27	P REAL(071)1 Q	# REAL (072)	
28	R REAL(C73); PRI	# REAL (074)	
29	THTA T REAL (075); PHI	# REAL (076)	
30	X # REAL(C77); Y	. REAL (078)	
31	Z # REAL(079); PSIS	# REAL (080)	

535		THTAS	· REAL(CAL)) DP	4 9EAL (082)	
233 -		cc	WTREAL(083)) DR	• REAL (084)	
234		CL	■ RCAL(085)) DV	# RFAL (086)	
235	······································	CK-	**************************************	* HEXE TOXX	
		CELYE	# REAL (C89); DELZB	• REAL (090)	
236		CELXS	· REALICATITO DELYS	9 REAL (092)	
237				# REAL (094)	•
238		CELZS			******
239		YALERR	· REAL (095) J PITEHT	• REAL (096)	
240		YANERO	■ REAL(C97) J BMEGY	# REAL (098)	
241		BPEUZ	-W-REALICYSII-PSRG	A SEVELLICOL	
242		871	+ REAL(101); BTZ	• <b>PEAL(102)</b>	******
		THIBL	W REAL(103) J KC	# REAL(104)	******
243		SFO	. REAL(105); SF1	4 REAL (106)	
244				· REAL (104)	
245		8F2	# REAL(107)) SF3		
246		8F4	# REAL(109); SF5	# REAL(110)	
247		3° 5	W REALITITITY SP7	W RESULTED	
248		5F8	• REAL(113); SF9	# REAL(114)	
249		871C -	W-REAL(115); 3711	# REAL(116)	
250		SF12	• REAL(117); SF13	• RF4L(11A)	
		SF14	U REAL(1191) 8715	# REAL (120)	******
251				. REAL(122)	
252		TIC	. PEAL(121)) TICT		
523		- DRBA	# REALTYZENT YERG	W REAL (124)	
254		QSA	# REAL(125); RSA	• REAL (126)	
255	a segment or an	PEG	U REAL(127)) YFC	■ REAL(12#}	
256		AEG	# REAL(129); RET	# MEAL(130)	
	-	HEN -	U REAUTIBLIS RED	U REAL (132)	•
257		T2	. REAL(133); DELXV	▼ REAL(134)	
258				W REALTISET	
257		CELYV	W REALTYDSTY DELZY		
260		CEL1	# REAL(137); DELE	e REAL(139)	
761 "		CEL3 -	W REALCISTI DELA	W REAL (140)	
242		CELVP	o REAL(141); DELMIS	• REAL(142)	
263		TH	W REAL(1431) THBS	# <b>9</b> EAL(104)	
264		PSBS	· REAL(145); THRES	# REAL(146)	
		P8988	THEALTSATTS THEAD	TEAL (148)	<del></del>
765		REF	. REAL (149) J PEF	• REAL (150)	
266				# REAL (152)	
267		YEF -		# REAL (154)	
265		BXED	• REAL(153)) F1		
763		FE	# 9EAL(155); F3	♥ REAL (156)	
27C		P81 <b>5</b> t	• REAL(157)) THASD	• REAL(158)	
271		<del></del>	<del></del>	# REAL(160)	<del></del>
272		CCEL1	D REAL(161); ODEL3	# REAL(162)	
273		CCELP1	# REAL(163); DOELP3	♥ REAL(164)	
		CCELVP	. REAL(165); DDELPP	# REAL (166)	
274			# REAL(167); DODELS	# REAL (168)	
275		DCCELI			
276		DCCEL#	# REAL(169); DRLAMP		
777		CRCAPY	- REALCITITE DREMIG	* RE*L11721	
278		RLAMY	w REAL(173)J RLAMP	# REAL (174)	
279		RPHIG -	w REAL(175); RP3[	# REAL(176)	
28C		RTHTA	• REAL(1777) XT	• REAL(17R)	
		YT	₩ REAL(1791) ZT	# REAL(180)	
281		CPSIS	# REAL(1813) DTHTAS	■ REAL(182)	
285			REAL(183)) PSIT	₩ REAL(194)	
-883		<del></del>		<del>_</del>	
284		PED	# REAL(185); YFD		
285		CPFF	W REAL(187); DYEF	▼ REAL(188)	
284		PEFL	· REAL(189)) PHIG	# REAL(190)	
287		CPHIG	W REALEITIII TOTACC	♥ RE4L(192)	
286		٧٣	# REAL(193) J DPHIO	# REAL(194)	
789		RCET	# REAL(197) TIMEO	4 REAL (1981	
29C			# REAL(199); TIMES	# REAL (2001	
291		TIME1			
292		TIMES	. REAL(POI); TIME	• REAL (202)	
293		Z# 1%	# RFAL(203); RTMIN	₩ REAL(2C4)	

```
• REAL(205); DUM • REAL(206)
• PEAL(205); DPSISD • REAL(206)
294
                      CTHASE
  1.
29 Ř
               ¢
                      CALCULATED VALUES
798
               č
298
                      ARG1+1++(GO++TM9L)/(RSTAR+TGRAD)
                      XINTIA + (IYZ-IX)/IYZ
St.75+PI=D=D
299
300
301
                      WALGOPIOR2
                      CONTRINISABANG
105
303
                      CS.ANG.COS(WANG)
                      SPER+1.DO/DBLE(FLBAT(NPPS))
304
                      THE . SPEP
305
                      CT#1.CC/DELE(FLBAT(NCT))
306
307
                      CTRK+SNGL(CT)
308
                      CTAVI-DC/CBCE(FCHAT(NOTA))
                      DELROL-PEAL (C19)/92D
DELROL-CELROL/R2D
309
310
                      LAMBIOLAMBI/RZC
311
                      PHIMAXEPHIMAX/R2C
                      GAPLB . GAPLB /RZD
                      YCL VYCL /RED
314
315
316
                      PHFOV#PHFOV/R2C
                      VRATE-VRATE/RED
317
                      RV81AS=RV81AS/R2D
318
                      GC#GC/RPD
                      PCL .PCL/R20
319
                      THTACUTHTACYRED
320
                      CI=(IT=IA)/IT
321
322
                      RIBIA/IT
323
                      RNGLINARNGLIN/R2D
                      YHFOYWYHFOY/RED
324
                      K4.K4/RED
325
326
                CPSIS+COS(PSIS)
C++++ JMAX+PRINT CONTROL. PRINTING SCCLRS FYERY JMAX INTERVALS.
327
324
                      JFAX-1.00/DT+.000001
329
                      INPUT(105)
330
331
                      THTANDUTHTA
                      333
334
335
                      TC4+TC3++2
336
                      705+T04++2
                      TC6+T05++2
337
                      <del>107+106++8</del>
338
                      T1=TC+2+
319
340
                      CTT+COS(THETAT)
341
342
                      STTUSIN(THETAT)
                      CP9+C9S(PSIT)
343
344
                      SPTUSIN(PSIT)
345
                      IF ( IRBLLDC . EG . 2) IACT . 2
346
                CHARA RANCE TARGET FRAM MISSILERRY IN FEET.
347
                      RTM#SGRT((XT-X)++2+(YT-Y)++2+(ZT-Z)++2)
348
                C====
349
                      WHITE SANDS ALTITUCE -4000. FT.
                C
                C+++-TMPORTANT-UEFINE-TIMEO-FOR-FACH-TRAUPCTORYY
                C....
                352
353
354
```

· BA

```
C---* BALLISTIC FLYDUT
IF (RCETall's) TIME48999;
 355
 356
 357
                                ITEMPOTIME+1.000001
                       CAPARAFIRST SCHEDULED PRINT TIME
357
                               PRINTMOSTEPP
 359
 360
                               CELX-XT-X
                               CELYOYTOY
361
365
                               CELZOZTOZ
363
                               DELXTODELX
                               CELYTHOFE
                               CELZTODELZ
 365
 366
                               CFE+0+
 367
                               CAC+0.
 368
                      C-****
369
                              EDC+T1
                               ECTOVIOUES
371
372
                               FC2eT2
                               EC3.ED1+.E
373
374
                               EC4.EC3+3.8
                               ECSATIMES
                      CELMX#DELMX/R2C IDELMY#DFLMY/R2D

SMOOD FORMAT(//2X,KA4,//S(2X,2X6,Y' & 1,011,5))

9CC01 FORMAT(//2X,*NULL ROLL MATE SENSOR!)

9CC02 FORMAT(//2X,*VROLL HULD!)

9CC04 FORMAT(//2X,*LATERAL ENABLE!)

9CC04 FORMAT(//2X,*LATERAL ENABLE!)
375
377
378
379
                      Proda Fermat(/JZX, IGUIDANCE ENABLE!)
90005 FERMAT(/JZX, IACQUISITION!)
380
381
                      90006 FORMAT(/JZXa TUNCAGE GYRM FOR HOLL YO VERTYCALT)
90007 FORMAT(1M1)
352
383
384
                      90010 FORMATI/#2X4+BERIN SEEKER CANT!)
385
                            9 CONTINUE
                                KUTTA T C
R E T U R N
186
387
389
                                 ENTRY DERIVATIVES
330.
                      •
391
                                KLTTA & KUTTA + 1
                      c....
393
                               ALTONZ
                              ALTONE
BURGONROUNROUNCETTOWNE
GEGALTORROUNLET/CROCALT)
METO CALCULATES VSND
CALL METO
334
195
396
                      Car
397
                          13 CONTINUE
399
                      c
                      COV ECS TO SCS THANSFORMATION CALL TREFEE
400
4C1
402
403
                      C. BC4 TO SCS TRANSFORMATION, SEQUENCE IS THYAS. PSIS
                         CALL TREFES
100 IF(KLTTA+NE+1) GR YO 505
IF(TIPE=LT+TH9LD)NX+)
404
+05
308
                               IF(TIME.GE-THOLD)NX-14
IF(GATE(003))GD TO 1235
407
408
                              1F(TIME+LT+TIME3)GB TB 1235
GATE(CO3)+SET
409
410
                               IPRINT-2
411
                               CONTINUE
                               IF (GATE (004)) 68 TO 1236
413
                              IF (TIME+LT+TIME1)00 TO 1836
GATE (CO+)+SET
414
415
416
                               SPTATOS
```

417	1236	6 CONTINUE	
418 419		TF(GATE(OC5))GB YR 1237	
420		GAYE (005748ET	
421		1PRINT=2	
422	1237		
423		1F(GATE(OC6)) 00 Y9 1238	
424		IF(TIME+LT+TIME+)G8 T8 1238	
425		GATE(CO6) #SFT	
427	1238		
422		1F1TTME+LT+T1100 T8 1239	
489		GATE (CO7) +SET	
430		IPRIATEZ	
431	1839	9 CONTINUE	
433	č	LOS ERROR IN SCS	
434	•	- CALL LOSERR	
435	Ç		
438	Ç**	SUBROUTING SEEK DETECTS TARGET WITHIN THE DETECTION RANGE OF SEE! TARGET WITHIN THE FIELD OF VIEW/SOAD-WISEEKER WITHIN LINEAR MANGE	ENI
437	<u>c</u>	CALL REEN THE DISCH OF ALENDAMANDEERS ATTAIN CHICKLE LANGE	
439	10	OF CONTINUE	
440	<del> </del>		
441	C++	MISSILE VELOCITY WAT AIR MAGS	
442		**************************************	
443		hncehnde+(1.+0.6.sin(wndv))	
445		LYS . WND.CSWANG	
446		CALL MCAUCE	
447	, c		
448		ANGLE OF ATTACK COMMONENTS TERMS FOR EGUATIONS OF MOTION	
45C		TERT'S FOR EGUATIONS OF HOTINA	
451	Coo	- 117 1 1 1 1 1	SYDITAL
45?		CALL FORMON	
453	C		
454 455	Can	*RUBROUTINE DIFEC CONSTRUCTS THE EQUATIONS OF MOTION  CALL DIFEC	
456			
457		TF(TJME+LT+T1)GB T9 406	
458		1F(*k0T+FL00)00 T0 6666	
455		PRINT 9CCC1;[PRINT=2;FLGO=+NOT+FLGO	
460°	6660	6° CONTINUE NX=33	
462	<del></del>		
463	C++	SUBROLTINE ECSKAGYAR CONSTRUCTS THE REEKER GYRO MODEL FOR EU	
161	•	CALL EUSKRGYRG	
465	520: C	3 COVALIVAE	
466 467	Č++	EC ALTOPILET	
468		- CALL EDAP	
469		GG T6 226	
470	Ç	statics of access to wants be	
471	C C	ENGIPEERING DESIGN AUTHPILOT	
472 473	5150	O   IF(TIME.LT.TIME3)GB TB 401	
474		1F(*****FtG9100 T0 0071	− <del>F</del> Ŀ0 <del>5−</del> −
475		PRINT 9001011PRINT-21FL05+.FALSE.	FL05
476	6671		FLG5
477		NX = 32 Smrgz=kb=yAwzrb	
478		מו במע בי משבי במים	

PAR

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479
                       C***CANTSEFMER
C*****CANTSEEMER*UNTIL ACGUISTTIBNITACG#21
                                 GMFGY+KS-(THTAC+THTAS)

IF(TACG-EG-27) GMFGY*KS-PTTERM

IF(ABS(GMEGY)-GT--10+72) GMEGY-SIGN(-10+72-GMFGY)

IF(ABS(GMEGZ)-GT--10472) GMFGZ-SIGN(-10472-GMFGZ)
481
882
...
484
485
                       C
                                  ICEAL GYRO
                                 GEAUBS21 =POMS22 = C+BS23=R
...
487
                                  R84-8531-P-8532-C-8933-R
488
                                  FIGTOPEUY-WSATZCOSTPSTST
485
490
                                 F3-0FEG7-RNA
                                 CPSISACOS(PSIS)
                                 IF(ISKR.EG.1)F1.e(OMEGY-RSA)/CP81R
IF(ISKR.EG.1)F3.eRMEGZ-GSA
491
493
                                 F4.C.
495
496
497
                                 LAMPR . DMEGY
                                  IF ( IACO . NE . 2) LAMPRELAMYREC .
                                      SYND ECUATIONS FOLLOW
498
                       τ
                                 CTHTASOF1
499
500
                                  CTHASCUFE
501
                                 CPSIS#F3
                                 CFSISDNE
507
                                 COMEGANTS
503
                                 ROLL RATE GYRO
                        C...
505
504
                           SUI
                                 IF (TIME+LT+TIME1)GO TO 404
ROLL OTHO EOS
507
508
                       Ceas.
                                 TPP3 # SIN(RTHTA)

"PPBA"# (COS(RTHTA)

CRTHTA = (PetmPauRetmP3)=TAU(RPS1)=C
509
510
511
                                  CAPSI - - (FOTHP3-ROTEPS)
315
                             CAPSI - TO THE THE STATE OF STATE CAMPING OF GIMBAL ANGLES
IF (TIME-LT-TIME-1GP TO 301
IF (TIME-LT-TIME3)GD TO 302
CTRECH-BOOKTATO-KOSTHTAS)
513
514
515
514
517
                                  THRBS-BC-(KC-THTAS-TXED)
                                  CPXEDWWED*(PXED#KQ#PS1S1
318
                                 PSRBS-BD-(KQ-PSIS-PXED)
THBS-KRGL-FHRBS-THTAS
PSBS-KRGL-PSRBS-PSIS
519
320
158
                        CHHECEAC EARD ZONE FOR PSBS,THBS
IF(ABS(THBS).LE.GAPLB) GB TO 16C
THBS + KGL+(THBS=S)GN(GAPLB,THBS))
522
523
324
324
526
                           160 TH83=0+
                           161 1F(ABS(PSES)-LE-GAPLE) GO TO 162
-PEGS * KGL*(PSES=9)Gh(GAPLE,PSES))
GO TO 163
527
52#
524
                           162 PSB9#C+
330
531
                           163 CONTINUE
                        C ... GUIDANCE FILTER
                                                                                                                                           WILL
                        COOOKO AND LAMBI ARE TIME CONTRALLED CONSTANTS
160 CONTINUE
532
533
                                 PEC+LAMPR+LAPBI+KB+THTAB
535
                                  VECULAMVR
516
537
                                 CPFF==BF+(PEF=KG+PED)
                                 CYEF == UF = (YEF = KG = YEO)
IF (ABS(PEF) = GT = GC) PEF = SIGN(3C, PEF)
538
519
54C
                                  TF (ABB (YEF) . GT . GC) YEF + 91 GN (CC, YEF)
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PEG#THRBS+THBS+PEF
541
542
                      YEG*PSRBS+PBBS+YFF
                      PEG . PEG
B43
544
                       TP (ABSTPEG) - GT - PCL TPEG = STGN(PCL - PEG)
545
                      IF (ABS(YEQ) . GT . YCL) YEG . SIGN(YCL, YEG)
546
                CHHADATE DECORPTER
847
                 301 CONTINUE
548
                      IF (TIME+LE.TIPE31G7 TO 4C6
                      G6 T8 (1401,1402), IROLLDC
549
                THOI CONTINUE
CHANNEPREVIOUS ROLL DECOUPLER
550
551
                      IF (IACG. EG+2 .AND. TIME GT. TIME# .AND. NULSKR. EG. 2) GO TO 300
552
                      PLAMYD-PSIS
553
554
                      ATHTR-BATHTERMALIR
555
                      G0 Y9 302
556
                  300 CONTINUE
                      CREAMYREAMYR
557
                      DRLAMPTHLAMPR
558
                  302 CONTINUE
559
                      RICY.PSIS
E60
                      RICPOTHTASORTHYA
561
562
                      RECURSCPURGAPP
563
                      RENORICY-RLAMY+RPSI
564
            -- 305 CONTINUE
565
                      IF (RED-LT-+4363)RED--4363
                      IF (RED+GT+1+7453) "RED#2"+7453
566
567
                      RETOREN/RED
                      PHICECONET
667
                GO TO 1404
569
870
                C++++LATEST ROLL DECOUPLER
571
572
                      CRUAMY#BR5#(PSIS=RUAMY)-
                      IF ( IACG . EC . 2) DRLAMY . O .
573
574
                      <del>alkesiorpsioszorlamycssopsis</del>
575
                      RECOS4+THTAS-SS+RTHTA
576
                     COMMCHECK FOR SATURATION
577
                     TECAPS(PHIMAXWABS(RET))-LT-RTSL FAND-RED-LT-REV/RET) GO TO 306
578
579
                C....
                  304 RETUSION (395 JAER)
580
                      IF(REC.GT.O.)RETEREN/RED
581
                 -306-CONTINUE-
382 ---
583
                      IF (ABS(RET) . GT. PHIMAX) RET +SIGN (PHIMAX, RET)
584
                 TBREDING ---
                 1404 CONTINUE
585
                      DAPHIGO-DO-AFHIG-DG-(1--BG/AF)-FH16
386
                      REF# (BG/AF) +PHIG+RPHIG
587
                      我在中中中大学中的世界
588
                      IF(ABS(REF).GT..17453) REF=SIGN(.17453,REF)
589
              - 303 CONTINUE
590
                      REGOREF - RVBIAS
591
225
593
                C. CONTROL SYSTEM, CANARDS FOR EACH PLANE ON COMMON SHAFT
594
            -- -- 307
                      CONTINUE -
593
                      IF (IACG.EG.2 .AND. NULSKR.EG.2) GB TO 226
                  221 CONTINUE-
536
597
                      YEG#0.
                      PEGVOV
298
                  226 CONTINUE
599
                      CALL CONTRL
600
               C++ 4TH BRDER RUNGE KUTTA INTEGRATION
601
                - 406 CONTINUE- -
602
```

\_ SA

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GB TA 50
€C3 ,
                       IFIKUTTA .NE. 1)
                      CZICH CATHT, OZICH, OPICH CEAHT, ORANYO, (BHTT) DORE, BISO, THTAS/PSIS)
604
                29
                      CONTINUE
605
                č
                      PROCESS TIC MARKS ON CHANNELS O AND A
606
607
                Ċ
608
                      IFITIME LT DELECTION TO 1777
605
                Ċ
610
                      SEY EVENT LEVEL
613
613
                č
                      IF (KAGE.EC.Z)TICL 4TICL 4.1
                      IF(MULL.EG.2)TICL.TICL+.2
614
615
                      TICLOTICLOOS
616
317
618
                      SET ACGLISITION SIGN
619
                C
                      IF(IACG.EG.2)TICL.-TICL,
420
                1777
                      CONTINUE
421
622
                      PHC #ATANZ (SIN (PHI) COS (PHI))
623
                      PROCESS MOAC BUFFER
624
                C
625
               C
                      PCAC(C1) #TICL/SPC
                                                         JHOAC(Q9) eTTCL/SF8
454
427
                      PCACIOZI - (ALT-4000-1/SFI
                                                         IPDACTIO1 . RPC . BPEGY/SFS
625
                      PCAC(03)=TOTACC/SF2
                                                         #DAC(11) #RPD#PEFL/8F10
623
                      PCACTONIUMZUNTHTAS7SF3
                                                         THORCITST BRESTHES/SP11
                      MCAC(C5) #R2D#P$15/SF4
                                                         IMOAC(13) ORPDOPEG/SF12
430
                      MCAC(CA) WRED DELREE/SFS
                                                         IMOACTIATORECTHRES/SFIS
631
                      MCAC(07) eR2DeDELVY/SF6
                                                         IFOAC(15) =R2C+CRLAHY/SF14
435
633
                      PEXCECS 1 4RED HOEL VP/SF7
                                                         THOAC(16) #RPD#THTA/SF15
                c
634
                      LIFIT HOAC BUTFUT
635
               č
616
                      CB 1892 TW1,16 ---
IF(ABB(MOAC(1)).81.0.9999)MDAC(1).81GN(.9999,MDAC(1))
537
638
               TX92
                      CONTINUE
635
640
                      <del>BUTPUT-PDAC-VALUES</del>-
641
642
                C
                     -CALL-MOACS(O)16/MOAC)
IERReISVOTAPE(SNGL(TIME)/RED*TXED)
643
                X
644
                      PRKTKEXTUPRIKTHU14EH6
655
                      IFITIME.LT. PRNTNEXT. AND. IMPINT. EC. 1188 T9 72
446
847
                       IPRINTEL
70 TOPISSINIPHII
448
644
                      TPP2+C05(PH1)
65C
                      PHC=ATAYE(THP1+THP2T
651
                652
                                                                                               20000
653
                č
                                          LINE PRINTER 1/8
454
655
656
637
                      IF (GATE (OC1)) 00 TO 1661
                      PRINT-90000yeseHEEGISEH* EXSEMECUTSEH:0%;
658
659
                     14HBF ,4H
14HBG ,4H
14HBRS ,4H
                                            AHRTTLAH
                                                            RTOL.
660
                                    , BF
                                             **HKG ***H
**HKB ***H
**HBV ***H
                                    .60
661
                                                            ,54,
662
                                    ,BR5
                                                            KP,
                                    IBRS
                                                            .KC.
663
```

664	14HBT1 ,4H	BTi	, 4HSTP .4H	,RT2	,
665	STANCPT FAM:	JCPT "	JAMSTT JAH	STT	, .
	14HCS .4H	*CS	, LHFFCM, 4HB	,FFCMP,	
	TAMETY JAM	JCTT	EMHA, TOAGHA.	ENTRAPT	,
	14HD .4H	»D	, 4HKB , 4H	,KG,	
	14MDELM14MY	DELMY -	AMEDO JAH	,EDO	
	14HEC1 .4H	,ED1	AHED2 .4H	ED5	,
4,4	14PED3 ,4H	,E03	AMEDA ALH	,ED4	,
~	14-ED5 .4H	EC5	4HKT10,4H	KTIN	,
• • •	14HFFALJ4HB	FFALB	JAHYCL JAH	YCL	
0.0	14HFFAN, 4HB	FFANB	SAHOF AH	,GF,	
• .	14HFFCL, 4HB	FFCLB	AHFFAZ, AHB	FFAZA.	
0,5	14HFFCN, 4HB	FFCNB	AHFFAM AHB	FFAMB,	
677	14HGAME, 4HB	GAPLE	AHPHES, AHV	PHERV.	
678	14HGC .4H	GC	. AHPFAX. AHB	FFAXA,	
679	THIACTIAN	IACY	- AMTRAL AMEDE	IRBLLDE	
680	14HIDLM.4H	, ICLM	,		
	14HIFUF . 4MA	. IFUF6	#HNULL #H	NULL	,
682	14HIRBL, 4HL	IRALL	4HKT20,4H	KTZO	,
683	14HYSKRIAM	ISKR	AMSS AH	\$5	
684	14HT 4H	IT	. 4HFBGN. 4H	FBGN.	-
685	TANTX JAH	71X	THEO JAH	.80.	
686	14H1YZ +4H	AIYZ	4HR2 4H	,R2	,
687	TANKA JAM	7K4	AMPCA AM	PCA	-
685	14HKB .4H	KB	AHRVRI AHAS	,RVBIAS.	
689	14HKC - 34H	KC	"TENTHYE . THL	THTOL	۵
690	14HKGL J4H	KGL	. AHFFAY . AHB	FFAYB,	-
691	TANKEC JAM	TKPC	- 44T1P5.4H	7173	
992	14HKRGL,4H	KRGL	AHAF JAH	,AF,	
693	14HKS 14H	/KS	ма, мунач	, KM	
694	14HLAMB 4HI	LAMBI	4HJMAX,4H	XAML	,
			3 T 1 B 1 A A 3 T 1		
			#HCG #H	, CG,	•
695	14HMASSJ4H	MASS	HAC DONAL		·
695 696		TMASS -	· . ·		
695 696 697	14HMASSJ4H 14HNRUN£4H	MASS -	JAHCO JAH	, CG,	
695 696 697 698	14HMASSJ4H 14HNRUNJ4H 14HPCL J4H	ANRUN APCL	JAHEG JAH	, CG,	
695 696 697 698 699	14HMASSJ4H 14HNRUNJ4H 14HPCL J4H 14HPHIMJ4HAX	ARUN PCL PHIMAX	; #HCG , #H ; #HTA , #H ; #HSB , #H	,CG,	
695 696 697 698 699 700	14HMASSJ4H 14HNRUNJ4H 14HPCL J4H 14HPHIMJ4HAX 14HPRINJ4HTM	ARUN APCL APHIMAX APRINTM	JAHCG JAH JAHA JAH JAHS JAH JAHJMAX,AH	,CG, ,SB ,JMAX	;
695 696 697 698 699 700 701	14HMASSJ4H 14HNRLNJ4H 14HPCL J4H 14HPHIMJ4HAX 14HPRINJ4HTM 14HRAPTJ4HZ	JMASS JARUN JPCL JPHIMAX JPRINTM JRAPTM2	JAHCG JAH  JAHA JAHA  AHAS JAH  AHAS JAH  LAHAS JAH  LA	GGA  S8 JMAX ,RAPTM1	,
695 696 697 698 699 700	14HMASSJAH 14HNRLNJAH 14HPCL JAM 14HPHIMJAHAX 14HPRINJAHTM 14HRAPTJAHMZ 14HRGETJAM	JMASS JARUN JPCL JPHIMAX JPRINTM JRAPTM2 JRDET	ATRAPTANHAL  LMHA, ATCHAL  LMHA, XAMLHAL  LMHA, TARNHAL  LMHAL  LM	JES JES JES JES JES JES JES JES JES JES	,
695 696 697 698 699 700 701	14HMASSJ4H 14HNRLNJ4H 14HPCL J4M 14HPHIMJ4HAX 14HPRINJ4HTM 14HRAPTJ4HM2 14HRGETJ4M 14HRFLEJ4HCT	JMASS JRUN JPCL JPHIMAX JPRINTM JRAPTM2 JRDET JRDET JRECT	JAHCG JAH  JAHA JAHA  AHAS JAH  AHAS JAH  LAHAS JAH  LA	SB JMAX ,RAPTMS ,DTA ,P1,	,
695 696 697 698 699 700 701 .702	14HMASSJ4H 14HNRLNJ4H 14HPCL J4M 14HPHIMJ4HAX 14HPRINJ4HTM 14HRAPTJ4HM2 14HRGETJ4M 14HRFLEJ4HCT 14HRFLEJ4HCT	JMASS JARUN JPCL JPHIMAX JPRINTM JRAPTM2 JRDET JRCET JRLAMP	JAHCG JAH JAHCA JAH JAHCA JAH JAHCAN JAH JAHCAN JAH	CG.  11.  S8  JMAX  RAPTMS  DTA  PI,  FSIT	* * * * * * * * * * * * * * * * * * * *
695 696 697 698 699 700 701 .702 703	14HMASSJ4H 14HNRLNJ4H 14HPCL J4M 14HPHIMJ4HAX 14HPRINJ4HTM 14HRAPTJ4HM2 14HRGETJ4M 14HRFLEJ4HCT 14HRLAMJ4HP	JMASS JRUN JPCL JPHIMAX JPRINTM JROET JROET JRUAMP JRLAMY	#HCG #H  #HSB #H  #HSB #H  #HRAPT #HHI  #HPST #H  #HPST #H  #HRPST #H	CG.  S8 JMAX ,RAPTM; ,DTA ,PI; ,PS1T ,RPS1	* * * * * * * * * * * * * * * * * * * *
695 696 697 698 699 700 701 ,702 703 704 705	14HMASSJ4H 14HNRLNJ4H 14HPCL J4H 14HPHIMJ4HAX 14HPRINJ4HTM 14HRAPTJ4HM2 14HRGETJ4H 14HRFLEJ4HCT 14HRLAMJ4HF 14HRLAMJ4HF 14HRLAMJ4HY 14HRNGLJ4HIN	MASS INRUN IPCL IPHIMAX IPRINTM IRAPTM IRCET IRLAMY IRLAMY IRLA	JAHCG JAH  JAHTA JAH  JAHTA JAH  JAHMAXJAH  JAHMART JAH  JAHMOTT JAH  JAH  JAHMOTT JAH  JAH  JAH  JAH  JAH  JAH  JAH  JAH	JCG. JS8 JMAX ,RAPTM1 ,DTA ,PI; ,PS1T ,RFS1 ,VRATF ,KM ,S6	; ; ;
695 696 697 698 699 700 701 .702 703 704 705 706	14HMASS,4H 14HNRLN,4H 14HPCL J4H 14HPCL J4H 14HPRIN,4HTM 14HRAPT,4HM2 14HRCET,4HCT 14HRLAM,4HCT 14HRLAM,4HC 14HRLAM,4HC 14HRUGL,4HN 14HRTMI,4HN 14HRTMI,4HN 14HST J4H	MASS NRUN PPLIMAX PRINTM RAPTM2 ROET RELEMMY RELAMMY R	JAHCG JAH  JAHCA JAH  JAHCA JAH  JAHCAPT JAH  JAH  JAH  JAH  JAH  JAH  JAH  JAH	SB JMAX RAPTMI DTA PII FRESI VRATE KM 196	; ; ;
695 696 697 698 699 700 701 .702 703 704 705 706 907	14HMASS,4H 14HNRLN,4H 14HPCL J4H 14HPCL J4H 14HPRINJ4HTM 14HRAPT,4HM2 14HRCET,4HCT 14HRLAM,4HC 14HRLAM,4HY 14HRNGLJ4HI 14HRTMIJ4HN 14HRTMIJ4HN 14HSTO J4H 14HS10 J4H	MASS ARUN PCL APRIMAN ARAPTM ARAP	#HCG #H  #HSB #H  #HSB #H  #HSB #H  #HRAPT #HM  #HRAPT #HM  #HPTI #H  #HPTIT #H  #HPSTT#H  #HRPSI #H  #HRPSI #H  #HRPSI #H  #HRPSI #H  #HRPSI #H  #HRPSI #H  #HS6 #H  #HS9 #H	JCG. JAN. JSB. JMAX ,RAPTMI ,DTA. ,PII ,RPSII ,RPSII ,VRATF, ,WM. ,S6. ,S9. ,S11	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
695 696 697 698 699 700 701 .702 703 704 705 706 907	14HMASS,4H 14HNRLN,4H 14HPCL J4H 14HPCL J4H 14HPRINJ4HTM 14HRAPT,4HM2 14HRCEL;4HCT 14HRLAM,4HY 14HRLAM,4HY 14HRNGL;4HIN 14HST J4H 14HS10 J4H 14HS10 J4H	MASS NRUN PCL PHIMAX PRINTM RAPTM2 RRUET RELAMY RRUGHIN RRY RRY RRY RRY RRY RRY RRY RRY RRY RR	JAHCG JAH  JAHCA JAH  JAHCA JAH  JAHCAN JAH  JAH  JAH  JAH  JAH  JAH  JAH  JAH	JCG JAN JSB JMAX RAPTMI JOTA PII JRSIT JRATFI JRATFI JSS JSII JSS	3 3 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
695 696 697 698 699 700 701 ,702 703 704 705 706 907 708	14HMASSJ4H 14HNRLNJ4H 14HPCL J4H 14HPCL J4H 14HPRINJ4HTM 14HRAPTJAHM2 14HRCETJ4H 14HRLANJ4HP 14HRLANJ4HP 14HRNGLJ4HIN 14HS7 J4H 14HS10 J4H 14HS12 J4H 14HS2 J4H	MASS ARUN PPLMAX PRINTM RAPTM2 ROET RELAMY RRUGLIN RRUGLIN RRUGLIN RST RST RST RST RST RST RST RST RST RST	JAHCG JAH  JAHCA JAH  JAHCA JAH  JAHCA JAH  JAHCAPT JAH  JAH  JAHCAPT JAH  JAH  JAH  JAH  JAH  JAH  JAH  JAH	JCG JAX JS8 JMAX RAPTMI JOTA PI: JRSIT JRATF' JRATF' JS5 JS1	3 3 4 4 3 4 3 4 3 4 5 4 5 7
695 696 697 698 699 700 701 .702 703 704 705 706 ):77 708 709 710	14HMASSJ4H 14HNRLNJ4H 14HPCL J4H 14HPCL J4H 14HPRINJ4HTM 14HRAPTJ4HM2 14HRCETJ4H 14HRLANJ4HF 14HRLANJ4HF 14HRLANJ4HF 14HRNGLJ4HIN 14HRTNJJ4H 14HS10 J4H 14HS4 J4H 14HS4 J4H	MASS ARUN PPLMAX PPRINTM ARAPTM2 ARDET ARLAMMY ARNGLIN ARTMIN	JAHCG JAH  JAHCA JAH  JAHCA JAH  JAHCA JAH  JAHCAPT JAH  JAH  JAH  JAH  JAH  JAH  JAH  JAH	JCG. JAX. JS8 JMAX. RAPTMI JOTA PI: FSST JRATF. JKM JS6 JS1 JS1 JS1 JCELMX	3 3 4 3 4 3 4 3 4 3 4 4 3 4 4 4 4 4 4 4
695 696 697 698 699 700 701 .702 703 704 705 706 )07 708 709 710 711	14HMASSJ4H 14HNRLNJ4H 14HPCL J4H 14HPCL J4H 14HPRINJ4HTM 14HRAPTJ4HM2 14HRCETJ4H 14HRLANJ4HF 14HRLANJ4HF 14HRLANJ4HF 14HRNGLJ4HIN 14HRTNJJ4H 14HST J4H 14HS4 J4H 14HS4 J4H 14HS6 J4H	MASS ARUN PPL MAX PPL MAX PRINTM2 ARDET ARUSEL TO ARUSEL TO	JAHCG JAH  JAHCA JAH  JAHCA JAH  JAHCA JAH  JAHCAPT JAH	JCG. JAY. JS8 JMAX JRAPTMI JOTA PI: FSSIT JRATF; JKM JS6 JS1 JS1 JS1 JS1 JS1 JS1 JS1 JS1 JS1 JS1	3 3 4 3 4 3 4 4 4 4 4 4 4 4 4 4 4 4 4 4
695 696 697 698 699 700 701 .702 703 704 705 706 907 708 709 710 711	14HMASS,4H 14HNRLN,4H 14HPCL J4H 14HPCL J4H 14HPRIN,4HTM 14HRAPT,4HM 14HRAPT,4HM 14HRCET;4H 14HRLAN,4HY 14HRNGL;4HIN 14HRT,14HN 14HRT,14HN 14HS7 J4H 14HS10 J4H 14HS4 J4H 14HS6 J4H 14HS7 J4H	MASS ARUN PPL MAX PPL MAY ARAPTM2 ARAPTM2 ARAPTM2 ARAPTM2 ARAPTM2 ARAPTM3	JAHCG JAH  JAHCA JAH  JAHCA JAH  JAHCA JAH  JAHCAPT JAH  JAH  JAHCAPT JAH  JAH  JAH  JAH  JAH  JAH  JAH  JAH	JCG JAN JS8 JMAX ,RAPTMI ,DTA ,PII ,FSSI ,VRATF, ,KM ,SS ,SS ,SS ,DELMX ,SF3 ,DELMX ,SF3 ,SF3	3 3 4 3 4 3 4 3 4 3 4 4 3 4 4 4 4 4 4 4
695 696 697 698 699 700 701 .702 703 704 705 706 707 708 709 710 711 712 713	14HMASS,4H 14HMALN,4H 14HMALN,4H 14HMALN,4HMZ 14HMAPT,4HMZ 14HMGET,4H 14HMCET,4H 14HMCET,4H 14HMAH 14HMGL,4H 14HMGL,4H 14HMGL,4H 14HST ,4H 14HST ,4H 14HS1 ,4H 14HS2 ,4H 14HS2 ,4H 14HSP ,4H 14HSP ,4H 14HSP ,4H 14HSP ,4H	MASS ARUN PPL MAX PPL MAX PRINTM2 ARDET ARUSELLAMY ARUSELLA	AHCG AH  AHSB AH  AHSB AH  AHSB AH  AHSB AH  AHRAFI AHMI  AHRAFI AH	JCG. JS8 JWAX ,RAPTM1 ,DTA ,PI1 ,RFS1 ,VRATF, ,KM ,S6 ,S9 ,S11 ,S3 ,S11 ,S5 ,SF3 ,SF3	3 3 4 3 4 3 4 4 4 4 4 4 4 4 4 4 4 4 4 4
695 696 697 698 699 700 701 .702 703 704 705 706 707 708 709 710 711 712 713 714	14HMASSJ4H 14HMASSJ4H 14HMALNJ4H 14HMAX 14HM	MASS NRUN PPLIMAX PPRIMM2 PRIMM2 RRUGLIN PRIMMY RRUGLIN PRIMMY PRIMY PRIMY PRIMMY PRIMMY PRIMMY PRIMMY PRIMMY PRIMMY PRIMMY	JAHCG JAH  JAHCA JAH  JAHCA JAH  JAHCA JAH  JAHCAT JAH  JAH  JAHCAT JAH  JAH  JAH  JAH  JAH  JAH  JAH  JAH	JCG. JAA. JSB JWAX JRAPTM1 JOTA JPI1 JRFSI JVRATF J	; ; ; ; ; ; ;
695 696 697 698 699 700 701 .702 703 704 705 706 707 708 709 710 711 712 713 714 716 717	14HMASS,4H 14HMASS,4H 14HMAN,4H 14HMPCL,4H 14HMPCL,4H 14HMRAPT,4HM2 14HMCET,4H 14HMCET,4H 14HMCET,4H 14HMCET,4H 14HMCH,4H 14HMST,4H 14HMST,4H 14HMS12,4H	MASS INRUN IPCL MAX IPCL MAX IPRITHE IRCE TO IRCE MAY IRCE	3 HCG 3 HH  3 HHS 3 HH  4 HS 3 HH  4 HRS 3 HH  4 HRS 1 A HH  4 HRS 1 A HH  5 HRS 1 A HH  5 HRS 3 A HH  4 HS 3 A HH  4 HS 3 A HH  5 HS 3 A H  5 HS 5 A H  5 HS 7 A	JCG. JAAN JS8 JMAN JMAN JOTA JOTA JOTA JOTA JOTA JOTA JOTA JOTA	; ; ; ; ;
695 696 697 698 699 700 701 .702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718	14HMASS,4H 14HMASS,4H 14HMASS,4HM 14HMASS,4HM 14HMASS,4HM 14HMASS,4HM 14HMAST,4HM 14HMAST,4HM 14HMASS,4HM 14HMS,	MASS ARUN PPLIMAX PPRIMM2 ARDET CT ARLAMMY ARUSLIN ART 10 ART	3 4HCG 3 4H 3 4HSB 3 4H 3 4HSB 3 4H 3 4HSB 3 4H 3 4HSB 3 4H 3 4HST 3 4H 3 4HST 3 4H 3 4HSS 3 4H 4 4HSS 3 4H 4 4HS	JCG. JAAN JS8 JMAN JRAN JOTA JOTA JOTA JOTA JOTA JOTA JOTA JOTA	, , , , , , , , , , , , , , , , , , ,
695 696 697 698 699 700 701 .702 703 704 705 706 707 708 709 710 711 712 713 714 716 717	14HMASS,4H 14HMASS,4H 14HMASS,4H 14HMASS,4HTM 14HMASS,4HTM 14HMAST,4HMC 14HMAST,4HCT 14HMAST,4HCT 14HMASAH 14HMSS,4H 14HSS,4H	MASS INRUN IPCL MAX IPCL MAY IPRITHE IRCLAMMY IRCL	##CG ##  ##S8 ##  ##S8 ##  ##S8 ##  ##S8 ##  ##RAPT ###  ##RAPT ###  ##PPT ###  ##HPPT ###  ##HPPT ###  ##HPPT ###  ##HPPT ###  ##HS6 ###  ##HS6 ###  ##HS6 ###  ##HS7 ###  ##HS71 ###  ###HS71 ###  ####  ####  ####  ####  ####  ####  ####	JCG. JAN. JSB JMAX ,RAPTMI ,DTA ,PII ,FSSI ,VRATF ,	; ; ; ; ;
695 696 697 698 699 700 701 .702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718	14HMASS,4H 14HMASS,4H 14HMASS,4H 14HMASS,4HTM 14HMAPT,4HMS 14HMAPT,4HMS 14HMAPT,4HMS 14HMAST,4HMS 14HMASAHY 14HMASS,4HM 14HS10,4HM 14HS10,4HM 14HS10,4HM 14HS12,4HM 14HS12,4HM 14HS50,4HM 14HS50,4HM 14HS50,4HM 14HS50,4HM 14HS50,4HM 14HS510,4HM 14HS510,4HM 14HS510,4HM 14HS510,4HM 14HS510,4HM 14HS510,4HM 14HS510,4HM 14HS510,4HM 14HS510,4HM	MASS ARUN PPLIMATE PPRIME PRIME	##CG ##  ##SB ##  ##SB ##  ##SB ##  ##MSB ###  ###MSB ###  ###MSB ###  ####  ##########  ##############	JCG. JANAX JS8 JMAX RAPTMI JOTA PIII FRESI JVRATF J	, , , , , , , , , , , , , , , , , , ,
695 696 697 698 699 700 701 .702 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719	14HMASS,4H 14HNRLN,4H 14HNRLN,4HM 14HPRIN,4HMM 14HRRPIN,4HMM 14HRRET,4HMCT 14HRCET,4HCT 14HRLAM,4HY 14HRLAM,4HY 14HRTMI,4HN 14HST J4H 14HS10 J4H 14HS10 J4H 14HS12 J4H 14HS12 J4H 14HS12 J4H 14HS50 J4H 14HS50 J4H 14HS50 J4H 14HS50 J4H 14HS50 J4H 14HS50 J4H 14HS51 J4H	MASS ARUN APPLIMATE APPLIMATE ARUN AR	##CG ##  ##S8 ##  ##S8 ##  ##S8 ##  ##S8 ##  ##MS8 ##  ##MS8 ##  ##MS8 ##  ##MS8 ##  ##MS1 ###  ##MS9 ###  ##MS9 ###  ##MS9 ###  ##MS9 ###  ##MS9 ###  ##MS9 ###  ##MS9 ###  ##MSF1 ###  ##MSF1 ###  ##HSF1 ###  #	JCG.  JANAX ,RAPTMI ,DTA ,PIII ,RPSII ,RRATF, ,VRM ,SS ,SIII ,SS ,SFII ,	, , , , , , , , , , , , , , , , , , ,
695 696 697 698 699 700 701 .702 703 704 705 706 %07 708 709 710 711 712 713 714 718 719 720	14HMASS,4H 14HMASS,4H 14HMANUN,4H 14HMPCL J4H 14HMPCL J4H 14HMAPT,4HM2 14HMAPT,4HM2 14HMCET,4HCT 14HMCET,4HCT 14HMCAN,4HY 14HMCGL,4HIN 14HS7 J4H 14HS10 J4H 14HS10 J4H 14HS12 J4	MASS ARUN PPLIMAX PPRIMA P	##CG ##  ##S8 ##  ##S8 ##  ##S8 ##  ##S8 ##  ##S8 ##  ##HRAPT ###  ##HPTT T ###  ##HPTT T ###  ##HPTT T ###  ##HPTT ###  ##HPTT ###  ##HS9 ###  ##HS1 ###  ##HS1 ###  ##HSF1 #	JCG.  JAN  JSB  JMAX  ,RAPTM1  ,DTA  ,PI1  ,FRSI  ,	; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ;
695 696 697 698 699 700 701 .702 703 704 705 706 %07 708 709 710 711 712 713 714 718 719 720 721	14HMASS,4H 14HMASS,4H 14HMANUN,4H 14HMPCL J4H 14HMPCL J4H 14HMANDTJ4HMN 14HMAPTJ4HMN 14HMAPTJ4HMN 14HMANJ4HM 14HMANJ4HM 14HMST J4H 14HMST J4H 14HMST J4H 14HMSF J4H	MASS ARUN PPLIMAX PPLIMAY ARAPTM	##CG ##  ##S8 ##  ##S8 ##  ##S8 ##  ##S8 ##  ##MS8 ##  ###S53 ##  ###S53 ##  ###S55 ##  ###S55 ##  ###S55 ##  ###S55 ##  ###S55 ##  ###S55 ##  ###S55 ##  ###S55 ##  ###S55 ##  ###S55 ##  ###S55 ##  ###S55 ##  ###S55 ##  ###S55 ##  ###S55 ##  ###S55 ##  ###S55 ##  ###S55 ##  ###S55 ##  ###S56 ##  ###S56 ##  ###S66 ##  ###S66 ##  ###S66 ##  ###S66 ##  ####  ####  ####  ####  ####  ####  ####	JCG.  JAN  JSB  JMAX  ,RAPTMI  ,DTA  ,PII  ,FRSIT  ,FR	, , , , , , , , , , , , , , , , , , ,
695 696 697 698 699 700 701 .702 703 704 705 706 %07 708 709 710 711 712 713 714 718 717 718 719 720 721	14HMASS,4H 14HMASS,4H 14HMANUN,4H 14HMPCL J4H 14HMPCL J4H 14HMAPT,4HM2 14HMAPT,4HM2 14HMCET,4HCT 14HMCET,4HCT 14HMCAN,4HY 14HMCGL,4HIN 14HS7 J4H 14HS10 J4H 14HS10 J4H 14HS12 J4	MASS ARUN PPLIMAX PPRIMA P	##CG ##  ##S8 ##  ##S8 ##  ##S8 ##  ##S8 ##  ##S8 ##  ##HRAPT ###  ##HPTT T ###  ##HPTT T ###  ##HPTT T ###  ##HPTT ###  ##HPTT ###  ##HS9 ###  ##HS1 ###  ##HS1 ###  ##HSF1 #	JCG.  JAN  JSB  JMAX  ,RAPTM1  ,DTA  ,PI1  ,FRSI  ,	; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ;

				,T1	
<b>50</b> 4	14472 344	5T.	4HT1 4H		•
726	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	TB	AMERY 34H	SPT	•
727	14HTHPL, 4HD	THALDS			
728	14F   FFE / 410		THAKO JAH	, KD.	
729	THYHYAJAHC	THYAC	•	IRAP	
	14HTHET, 4HAT	THETAT	, 4H JRAP, 4H	JAME	
730	14HTHRE'S 4HD	THOLD	•		
731		TIC	AHTICI,4H	TICI.	
732	14HTIC J4H			TIMES	
733	EHA (3417HAT-	EBMIT	, ampime, 442	•	
	14HTIPE, 4H1	13MIT.	, 4HTIME, 4HC	.TIMEO	•
734	14, 11, 24	ITIPI	TEHNY SEP	707	
735	14417171344	• -		,K5,	
736	1444460444	AHEAA			
	TANZMINA 4H	- JZMTN ^	" THAIRE " THE	TIMER	•
737	14HWND8+4H	HADO	44ZM1N34H	ZMIN	
738					
739	GATE (CC1) #SE	. }			
740 1661	CONTINUE				
740	PRINT-90007			-	
741	PRINT 90000	A.ALDRAJ.	AHECTI, AHLE: .	414 .	
742	PRINT BUUCUI		AHRSA JAH	RSA	,
743	14HTIPEJ4H"	FTIME	_	Ü	
	14FDELV, 4HP	DELVP	المبدو للابدو		*
744	TAKY YAH-	τV	HA, WHA,	» W	•
745	A A LIMBIO A A A A A	THTA	AHPHO JAH	PHD	,
746	14-7474348	-		TOTACE	-
748	-IANDELZJAH	DELZ	PHYSTA, WHEC		
	14HDZ JAH	DZ	AHDY JAH	ρŊΥ	
749	-TANCPHITAN"	CPHT	AHDTHT, AHA	DTHYX	
750			HDPSI.4H	DPSI	
751	14HDX JAH	, DX	•	,00	_
and the second s		70R" ""	- HAK DONAK	·	*
752	14HDP 44H	, DP	HAR HOHAL	, DW	
753			-JAHOV-JAH	*0V	
754	* *** ***		AHMACH, AH	MACH	
755	14HVRH JAH	, VRW			•
		" "YGAP "	j'ahpst-j'ah	, PST -	•
756	14HP 4H	ρ	AHC AH	, Q	
757		-	- ANDELVIANY	DELVY	,
758		;R	• • •	DELXV	,
760	144428 344	.AZB	. AHDELX. AHV	- 1 1 1 1	
	- TANCELYJAHY	TOELYV	~~*#DELZJ4MV~	DEFSA	•
761		×	AHY AH	, Y	•
762		-	MAR PHAME	AMB "	
763	-14HZ 74H-	, Z		YT	,
764	14MXT #4H	»XT	JAHYT JAH	, , ,	_*
		OTHTA			
<b>1.8</b>	14HCPHI.4H	CPHI	#HSPHI#H	SPHI	<b>A</b>
766			- HARTS9314H -	75731	<del></del>
767	- INICESIAN	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		GZB	,
748	1440991.449	CPSIS	AHGZB JAH		-
	- 4 AMRYR AH	~#GYB	- T#HGX8- 3#H	• GXB	
19	מחחחף לאופם	ATUAHALAN	AHPILS, AHTI	ه ۱۹۴۹	
771	FOITH JOUG	L ADBUIA			
778	14HCDPH; 4HTC	)- 100PH10		PEG	,
773	14HCELX.4HS	DELXS	AHPEG JAH	• •	
		<del>}yDEL#13</del>			)
7711	14HCELZ,4HS	DELZS	, AHOMEG, AHA	OMEGA	
775			JAHDFEF JAH	DPEF .	,
776	14HOYEFIAH.	FOYEF		RTM	,
	14HOTHT, 4HA	S DTHTAS	HRTH JAH		•
777	14HKT JAH	3KT	14HPEFL14H	PEFL	
775	14HNULL AH	NULL	. 4HDELR . 4H	, DELA	
779	I TORULUS TO			PSR3	
780	- LAHEMEGY 4 HZ			PEF	
	14HPED .4H	PED	AHPER JAH	-	•
781	14HP1TE AHR	o spitero	- JAHPHI GTAM	, PH13°	
782	14HP515,4H	PSIS	,		
783			JAHTHRS, 4H	THBS	
784	- 14HPXEDJ4H	- PXED		DELI	
	14HP585,4H	PSPS	. 4HDEL1.4H		
785		- JRLAMY	JAHRUAMJAHP		
786	1.可以以致2000年1.00mm。 4.6.40mm。1.4.40mm。		AHTHRE AHS	THRBQ	≱.
787	1447474,448		- JAHPEF JAH	PEF	
788	14myEF 74H	y yer		-	
	14HYED JAH	, YED	AHPED AAH	PED	•
789	- TAHYER JAH	YEF	, SHYBPB, 4H	, YBRG	
7 <del>9</del> 0	. Ishack ban	# + GF	• · · · · · · · · · · · · · · · · · · ·		

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DELYS
791
792
                      14HYEG JAH
                                     YEG
                                               , AHDELY, AHS
                                                               YAWFRE
                      THYAWE, AMRR
                                     TYAWERR"
                                               , AHYAWE, 4HR9
                                                               LAMPR
793
                      14HLAMY, 4HR
                                     ,LAMYR
                                                , AHLAMP, AHR
                                               THEADSTAN
                                                               JAPS
794
                      14FCSA JAH
                                      JUSX
795
                      14HCPSI,4HS
                                     , DPSIS
                                               , AHIACG, AL
                                                               IACG
796
                      14HPSR9,4HS
                                     PSRRS
                                               PHOEN "TH
                                                               REN
797
                       PRINT 90000,2,4HL4GI,4HC1
798
                      14HGATE, 4H
                                    1, GATF (001), 4HGATE, 4H
                                                               PAGATF (OA2).
799
                      24HGATE, 4H
                                    3, GATE (003), 44GATE, 4-1
                                                               4. GATE (004).
                      24FGATEJ4M
                                    5,GATE (005), 4HGATE, 4H
800
                                                               6 GATF (COS)
901
                      34HGATE,4H
                                    7, GATE (007)
                       PRINT 90000,4,4HAERO,4HDYVA,4HHICS-4HI
802
                                     .CLC
                                               JAHALB JAH
                      SAHCLD JAH
                                                               , ALB
E08
                      14HCKR JAH
304
                                     . CNR
                                               JAHCHS JAH
                                                               CMB
                                               AHCAZ AH
505
                      14507 348
                                     CY
                                                               CAZ
                      HAT GUOHAT
506
                                     JCLP
                                               TAHEN JAH
                                                               -CN
                                               , AHCHCG, AH
807
                      14HCYCG,4H
                                     ,CYCG
                                                               , CMCG
                                               AHCLS AH
808
                      14HANB JAH
                                     JANE
                                                               CLP
                      14HCMB JAH
                                     , CMB
809
                                               . AHENR . AH
                                                               , CNB
                                     THASO
                                               AHOTHA, AHSD
                      14MTHAS, 4MD
                                                               DTHASD
  1 8
  5.
                      14HPS (5,4HD
                                     PSISD
                                               , 4HOPGI, 4HSD
                                                               , DPSISD
810
                      XHACHHJXHAI
                                     TALPHA
                                               AMBETA, AH
                                                               BETA
                       PRINT 90000,1,4HRAP1,
811
                      14MSTT 74M
                                     STT
                                               AMETT AH
                                                               CTT"
915
                                                               CPT
813
                      14H8PT J4H
                                     ,SPT
                                               JAHCPY JAH
  1.0
                      14FTH 34H
                                     /TH
                                               JAHXETA,AH
                                                               XLTA
                       PRINT 90000,3,4HDEBU,4HB PR,4HINTI,
615
                      TAMBELX34HB
                                               PHACETA TANB
816
                                     JCELX8
                                                               DELYA
                      : AHDELZ, AHB
                                     , CELZB
                                               JAHDELX,4HS
                                                               DELXS.
                      14HDELY, 4HS
                                     DELYS
518
                                               #HDELZ: 4HS
                                                               DELZS
819
                      SAHKUTTJAHA
                                     KUTTA
                      14HPITEJAHRR
                                     "PITERR
                                               JAHYAWE'S 4HRR
820
                                                               , YAKERR,
821
                      LAMPITE, AMRO
                                     PITERB
                                               JAHYANE JAHRO
                                                               YANERA,
822
                      34HCRLAJ4HMY
                                     JUREAM'
                                               JAHF3
                                                               7F3
                      34HDRPS, 4HI
                                     DRP91
                                               AHDRTH, AHTA
                                                               DRTHYA
823
                      34MCRPH, 4HIG
                                                               RPHIG
824
                                     DABHIG-
                                               JAHRPHT, 4HG
825
                      14HDELV.4HR
                                     DELVE
                                                               . DPHIO
                                               . AHDPHI. 4HO
826
                                                               VSVD
                      14MG
                             54H
                                     , G
                                               , AHVSND, 4H
                      14HISKR.4H
                                     . ISKR
827
                                               JAHIACTJ4P
                                                               , IACT
                                               JAHTRAP, AH
                                                               , TRAP
828
                      <del>I4HIOUI34HDE</del>
                                     TIGUIDE
                                               . 4HNAVY, 4H
829
                      14HKAGE 4H
                                     KAGE
                                                               NAVY
                      34MF1 ###
14HNLM ###
                                     IF1
                                               , SHORLA, SHIP
830
                                                               DRLAMP
                                     NUM
                                               . MHTPRT . AHNT
                                                               , IPRINT
ê3i
                      14HKPP5,4H
835
                                     INPPS-
                                               JAHNOT JAH
                                                               NOT
                      14HNDTAJ4H
                                     NOTA
                                                               NULSKR
833
                                               , 4HNULS, 4HKR
                      34HPEFLIAH
                                     TPEFL
                                               JAHPHIG 4H
                                                               PHIG
834
                                     RHA
835
                      14HRH8 .4H
                      14452 J4H
                                     125
                                               JAHOELR, AHAL
                                                               DELRAL
836
                                               AHRET JAH
                                                               RET
837
                      14HRED .4H
                                     RED
                                     , REG
                      14HREG JAH
838
                                               , SHRPST, SH
                                                               RPST
                      14HRTHT, 4HA
                                     PRTHTA
840
                      <del>1418470,444</del>
                                     YESMOK
                                               JAIHAMEGJAHZ
                                                               784E97
                      14HKX .4H
841
                                     ANX.
                       IF(IMPACT)PRINT 90000,2:4HIMPA,4HCT1
842
                72
843
                      14HPCAT, 4H
                                     PCAT
                                               , WHE CAX, 4H
                                                               PCAX
                                     JPC++
                      14HPCAYJ4H
                                               JAHPCAZ,4H
844
                                                               PCAZ
                                     PCA
                      14HPCA JAM
845
                        15(1MPAGT GORGE ERROR)
846
                                                        END-RUK
847
                 50
                        CONTINUE
848
                C
                       DISPLACEMENT ERRORS FROM AIM POINT
849
850
```

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851
852
                       DISPLACEMENT ERRORS FROM SPOT
                C
                       CELXAXIAX
                       CELY.YT-Y
853
                       CELZEZTEZ
754
                       IF (YIME .LT. TIME3)GO TO 51
855
856
                C
                       IF (ABS(DEL1 ).GT.DELHY)DEL1 .SIGN(DFLPY, PFL1)
857
858
                       IF (ABS(DELVP).GT.DELMX)DELVP.SIGN(OFLYX.DELVP)
                       IF (ABS(DEL3 ).GT.DELHY)DEL3 #SIGN(DELPY,DEL3)
859
                          TABS (DCELVP) - GT - VRATE ) DOFL VP4STGM (VRATE - DOFL VP)
560
                       IF (ABS(DDEL1 ).GT. VRATF)DDEL1 4SIGN(VRATF, CDEL1 )
861
                       IF (ABSIDDEL3 ).GT. VRATE DDEL3 #SIGN(VRATE, DDEL3 )
862
                       1F(IACT.GT.0)GB T8 51
863
                       DELT ALAEGABES.
864
                       DELVP . PEG
865
866
                       CELS & STEGSHEG
                       IF (IACT . EG . 2) DEL 1 . REG. YEG
867
                       IF(IACT.EG.2)DEL3.REG.YEG
868
869
                   51 CONTINUE
                        RETURN
570
                C
871
872
                        ENTRY FINISH
                C
873
874
                       IF (IACG+EG+1)G9 T6 40
875
                       XT W XT+DTRK+VXT
876
                       YT . YT+DTRK+VYT
877
478
                       CONTINUE
879
                       VM8#U#U+V#V+###
                       VP#8CRT(VP9)
880
881
                       TOTACCU(SGRT(AYB+AYB>AZB+AZB))/MASS
                      HTRAUECTORY-TERMINATION
882
                       IF (TIME . GT . 5 . . AND . Z . GT . ZMIN) GB TO 45
883
                       1F(2+LT+ZM1N)08 TO 157
884
885
                    45 CONTINUE
                       CELXT -W-XY=X
886
                       DELYT . YT-Y
887
                       DEL 27 -- -- 27-2
888
                       CELXTB EB11 DELXT EB12 DELYT EB13 DELZT
889
                       CELYTO-FUEL-DELXT-EB22-DELYT-EB23-DELZT
890
                       DELITEREGGIODELXTOEB320DELYTOEB330DELIT
891
                892
                       VERLAMMATANZ( -DELZ, SCRT (DELX+DELX+DELY+DELY))
893
                      HOREAMMATANZ(DELY/DELX)
894
895
                C++ TOTAL MISSILE NON-FIELD ACCELERATION
336
897
                       GAMPO-ATANZ (WOU)
                       -R1U#9#5GRT(U#U+###1::
898
                       GAMYWATANE(V, RTUWS)
899
               C## BCS TO VCS TRANSFORMATION CALL TRSFEV
900
901
                       DELMISOSORT (DEL,YV++2+DELZV++2)
305
                       G8 T8 73
903
                   157 CONTINUE
904
                C++++ RANGE TARGET FROM MISSILE-RTM IN FEET.
905
                     ---RTM#9GRT{{XT=X}##2+{YT=Y<del>}##2+</del>{ZT#2}##2}
906
907
                C. + + + POINT OF CLOSEST APPROACH COMPUTATION PCA IN FEET.
                       IF (RTH. GT. PCA) GO-TO-55
908
                       PCATHSNGL (TIME) JPCAX=XJPCAY=YJPCAZ=ZJPCA=RTM
909
                    55 CONTINUE
910
                       G8 T8 9
911
                       IMPACT - THUE
912
```

A. A.

913		IPRINT=2
914 ~		THIT - THIT - THE THE THE TANK HE TE TO THE T
915		G8 T8 9
916	9999	GAYEL JUZIVSET
917		ERROR . TRUE.
913		G6 T8 7Q
919	9998	PRINT 90000,5,4HEND-,4H8F-F,4HILF ,4H8N U,4HNIT!
920		14HLUNI,AHT JUNIT
921		D8 3121 Ie1,16
255	3151	POXC(1) 40.
323		08 3122 Iel,1500
924	X	CALL WOACS(0,16,MDAC)
925	3155	CONTINUE
<b>i</b> •	* *	CALL BESF(IE)
2.		CALL HEOFABO
34		CALL KESFESH
926	X	CALL MODE('RI)
927	X	CALL MODERAPA
928	×	CALL WEOF
929	<b>.X</b>	CAUL PLOT(1) TIME1/271 TXED 1)
930	X	CALL FGERLS(10V 1)
<u> 431</u>		STAF
938		END

```
SUBPOUTINE SEEKER(SRNGE, REFLEC, ERR, ERO)
                    DIMENSION TANGE(18) TARLEC(2) THE (18,2) TLES(19), TERB(19,6)
 7
                    CIMENSION TRAD(6)
 3
                    14000.,5000.,6000.,8000.,10000.,12000.,14000.,16300./
 3
                    DATA TRFLEC /1.25,5./
DATA TLRS /-1.5,-1.333,-1.167,-1.,-.833,-.667,-.5,-.333,-.167,C.,
                    1.167,.333,.5,.667,.833,1.,1.167,1.333,1.5/
                    CATA TRAD /4.3E-14,4.6E-13,4.5E-12,4.1E-11,4.1E-10,2.6E-9/
 q
                    CAYA TM8/9+3E+11,2+6E+11/9+4E+12/5+6F+12/7+6E+12/2+92+12/1+42+12/
10
                    19.0E-13,2.1E-13,4.3E-14,5.0E-14,3.0E-14,2.2E-14,1.4E-14,7.5E-15,
12
                    25+0E-15,3+4E-15,2+6E-15,
13
                   33•7E-9,9•CE-10,3•7E-11,2•1E-11,1•4E-11,9•2E-12,5•0E-12,3•3E-12,
14
                    48.4E-13,3.7E-13,2.0E-13,1.4F-13,8.4E-14,4.6E-14,3.0E-14,2.0L-14,
15
                   51.8E-14,1.05E-14/
16
                    DAYA TEROJ-201-201-1055-1-0861-1080-1-6251-10251-0251-0251-05570-0555
17
                    1.75,1.05,1.2,1.3,1.4,1.5,1.5,1.6,
17
                    2-401-401-31951-3.851-3.61-3.351-7.81-2.11-.851.412.1513.113.451
                   33+7+3+75+3+9+3+95,4++4+
19
20
                   4-4.7,-4.7,465,-4.5,-4.5,-4.2,-3.2,-2.6,-1.15,.7,2.3,3.2,3.5,3.7,
21
                   53,75,3,8,3,9,3,9,3,9,
55
                    6-3-5,-3-4,43-25,-3-1,-2-3,42-2-3,-2-8,-2-5,-2-05,-1-13,0-,1-3,1+3,1+7,1+85,-
                   72-1,2-4,2-5,2-6,2-6,2-6,
23
24
                   8-3,55;=3-55;=3-5;-3-4;-3-2;-3-0;-2-85;-2-5;-1-8;--9;--9;--9;-05;-25;
25
                   9.5,.7,.9,1.,1.05,1.1,
26
                   X48.4,4244/42435/-243,4242,424,454.455/-1.4.1.4.495/-4.834-4.534-4.35/
27
                   8--21--17--05,-025,-05,-05/
28
                    CIPERSION ANS(4), AERD(4)
29
                    VOECHE STREET ATAC
                    1. #12.
30
                    CALL FIND(I, TRNGE, 18, SRNGE)
31
32
                    IFTI.EG.IST GO TO 10
33
                    ISOI
                     CALL
34
                          HTERP TANS, THE STATE RECT
                 10 HESFUNCTION (AHES SRNGE , REFLEC)
35
36
                    RRRSERRS57+296
                    INIS; JOJH
CALL FIND(I,TLOS,19;RRR)
37
38
                    CALL FIND(J, TRAD, 6, HS)
39
40
                     17:1:4E:13)---09-79-20
41
                    IF(J.EQ.JH) GB T9 30
                 20 ISBIJ JHWJ
CALL NTERP (AEND, TERB, I, TLDS, 19, J, TRAD)
47
43
                 30 ENDWFUNCTION(AEND, RRR, MG)
44
45
                    ER9 . END/4./57.296
46
47
                    END
```

```
SUBROLTINE AERO (T1,T2,FMAC- ALPHA,BETA,DFLPIT,CELYAW,DELROL,
 2
                                   CNICHOSTEVICUNCOTCATCUPTCUDICHOTCHADICUNG, CLNADI
                      Ċ
                                INPUTS
                      000
                                           TIME + SEC. TIME TO START CONTROL PHASE - SPC.
                               T1
                               12
                                           FREE STREAM MACH NUMBER
                               FFACH
                      C
                                            . ANGLE OF ATTACK (PITCH PLANE) - DEG.
                               ALPHA
                                            W INGLE OF ATTACK (YAW PLANE) - DEG.
10
                               BEYA
                                          • CANTROL DEFLECTION ANGLE (PITCH PLANE) - DEG.
• CONTROL DEFLECTION ANGLE (YAN PLANE) - DEG.
• CONTROL DEFLECTION (ROLL) - DEG.
                               DELPIT
                      000
                               CELYAN
 12
                               CELROL
13
14
15
                               SUTPLT
                                           * NORMAL FORCE COEFF.

PITCHING MOMENT COEFF.

TAN FORCE COEFF.
                               CPCO
17
                      C
                               CY
18
                      C
                                           . YAN HOMENT COFFE
                               CLNCG
19
                      C
20
                                            W AXTAL FORCE COEFF.
                      C
                               CLP
                                            . RALL DAMPING COEFF. . (1/RAD)
21
                                        PITCH DAMPING COEFF. DUE TO THETA DOT
PITCH DAMPING COEFF. DUE TO THETA DOT
PITCH DAMPING COEFF. DUE TO ALPHA DOT
AND AMPING COEFF. DUE TO PSI DOT
WANDAMPING COEFF. DUE TO ALPHA DOT
55
23
                      C
                               CHO
                               CPAD
24
25
                               CLAR
                      C
                               CLNAD
76
27
                                TABLES
A K
                                           TABLE OF CN FOR CONTROL PHASE
TABLE OF CA FOR CONTROL PHASE
TABLE OF CA FOR CONTROL PHASE
TABLE OF CN FOR BALLISTIC PHASE
TABLE OF CMCG FOR BALLISTIC PHASE
29
                               TCA1
                               TEMEB1
10
31
                               TCA1
33
                      Ċ
                               TCPCG2
                                         TABLE OF CREE FOR BALLISTIC PHASE

TABLE OF DELTA FOR CNOCMED

TABLE OF PHACH FOR CONTROL PHASE

TABLE OF FHACH FOR CLPACLD

TABLE OF FHACH FOR CLPACLD

TABLE OF FHACH FOR CHACLE

TABLE OF FHACH FOR CHACLE

TABLE OF FHACH FOR CHG
34
                               TCX2
                               TCELT1
                      C
                               TPACHE
38
37
                               THACHS
38
                      C
                               TPACHS-
                               TPACHA
19
                                TPACHS
                                           P-TABLE OF FHACH-FOR CA (BALLISTIC PHASE)
40
41
                      C
                              -DOUBLE-PRECIBION-T1:T2-- --- TCN1(6,7)3),TCN2(6,6)
DIMENSION TALP(6),TDELT1(7), TCN1(6,7)3),TCN2(6,6)
DIMENSION TCMCG1(6,7)3),TCMCG2(6,5);TCA1(6,7)3),TCA2(15)
-42
41
44
45
                               CIMENSION TCLP(8), TCLD(8), TCMQ(10,5), TALP&(10)
                               DIPERSION THACHI (3) THACHE (5) THACHS (-8) THACHO (5) THACHS (15)
46
                                                              ACMCG(8), ACY(8), ACLNCG(A), ACAP(8),
47
                                DIMENSION ACN(8),
                                -ACAS(8) ACAS(8) ACUP(R)
48.
                                                                              ACLD(>); ACMO(4); ACLNR(4)
                                DIPENSION ISAVE(13)
49
                                              -ISAVE
                                                              --/13+0/ --·
50
                                -Cata
                               DATA TONS
                                     *1 *25
                                                                                  7193
                                                                                                  71178
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                                                                  7-11
                                                                  1.87
                                                                                                 12.72
53
                             X
                                                                                  11.35
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44
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                                     -1+
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59
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56
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57
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85.
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                                                                                  12179
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63	x •c	<b>1.05</b>	.1.85	.2.54	, 3.31	,4.2×	مِه وَ
r	X	71738	71795	- 72164	13.45	14.39	5 48
5	X 1 e	.1.56	,2.1	12+8	,3.56	,4.5	10 .8
8	X -51	7*1-17	26.05	11.53	25.8	-1413	<del></del>
7	X +1.7	/64	• 59	11.7	13.06	14.65	• •15 1•0
8	X 01.2	••0	41.	12.24	13.65	,5.05	-10 1.0
9	x6	1.48	11.56	12.75	4.05	,5.23	-5 1.0
0	x. •0	1.05	. 15.5	13.3	.4.25	2.35	0 1.0
1	X .43	1106	12.6	13144	44.28	,5.39	5 1 • 0
5	3 10	15.1	₹185	13.5	14.38	73147	
3	DATA TONE	-		_	_		
<b>7.</b>	x •0	93	11.8	.2.29	12.94	13.8	. 0 .4
5	X •0	1.05	1.85	12.54	13.31	.4.28	0 •8
16	X ∙C	1.05	15.5	.3.3	.4.25	,5.32	0 1.0
7	x •0	/·85	,1,8	.2085	14.2	,5.6	0 1+3
8	X •0	1.59	71.4	15.2		_1413	7 0 118
9	DATA TOMO			<del>-</del>	_		
0	"# 3·6	140	,3,35 °	2:35	8.74	1213	3 *20 44
1	X 3.4	3012	11.9	111	1145	2.4	-15 •4
Z	. X. 5184	1.57	, 153	75	· • • 5	1 + 2	-10 +4
13	X 1.25	J • 37	·*·75	1.32	470	,••3	*5 *4
*	<del>- x - 0 -</del>	321.52		<u>1.51.95</u>	20115		•
5	X -1+1	<b>**2*35</b>	1.5.5	#=1.7	J-1+5	-1-35	
6	X	142.9	. 5 . 52	-5.05	1-1-94	,01.65	10 •4
17	X 3.85		,3.6	32.16	41.7	.1.5	8. 05-
· · · · · · · · · · · · · · · · · · ·	<del></del>		-71.95	- <b>3 • 8</b> π	4.3	) + <del>1</del> 1 .	-15 +8
19	X 3.1	#1·65	, • 35	,-:4	7	·-·55	-10 -8
0	- E9 1 1 65	-143	3-1-08				, ,
) <u>i</u>	× •0	1-1.7	85.30	1-5-5	4-1-98	<b>,-1.52</b>	0 .8
5	X +1+2	7 <del>-2</del> -37	1.5124	2.5	2 - 35	/*1=8	, 5 +8
3	X -3.94	1-3-1		2.98	4-5-7	1-5-16	10 .8
18	<del></del>	14196 -	/3.17	11:98	11.3	11.	* =20 1 ±0
15	X 4+98	/3/32	11.52	, . 53	4 . 4	, 2 . 79	-15 1.0
6	X3155	7114	1457	301015	10515		-10-110
17	X 147	**05	1-1-42	. ~3.0	3+5	. • 2 • 72	•5 1•0
***************************************	x	- 141.65 -	143135	1-4-4	1-411	1-2-0+	0 1.0
19	X -1.53	1-3-3	#44·57	4-4.75	2-403	1.3.5	5 1.0
10			~ J=5·27	,-4,9	, -4445	/ <del>-3</del> -38	/ 10 1:0
1	DATA TOPE					<b>4</b> 4	
15	<del>- x - 0</del>	1-1-53	- Ingal	1-1-45	19145	<del></del>	
3	X •0	# <b>-1.7</b>	1.5158	3.5.5	-1-98	4-1-52	0 .8
	• <u>· · · · · · · · · · · · · · · · · · </u>	7=1"-65.	1.2135		4-4-1	400E=1	a 0 1 s 0
5	X •0	9	/*1·8	2.38	2.17	4 • 4 6 5	0 1.3
16	× •0	1a158 _		* , 4157	40,57	<b>₽●</b> ▼57	/ 0 1+8
7	DATA TCA1						
8	<del></del>	7169		<del></del>	70176-	***05	T.20
9	X •585	••506	\$85.	4 . 24	1.173		• •
Ċ	~ X 495	**35	* 1*275	1 · 1 A 9	1.108	# • 0 <del>9</del>	· ·
1	X •928	,.3ii	, 426	1 4 2 4	::245	. • 22	
	- X +295	11294	7*513 -	-,,341	11353	,•19 ,•404	, 0 .6
3	X •32	366	412	1,476	4.425		10
+			7+50E	<del>, , 5}</del>	r v 529	4.061	
.5	X •78	#•767 205	. · 652	4.419	1.24		• -20 ·8
lé		**38*	• • 35	298	153	068	-
17	X •51	**419	345	25	1196	, • 153	
	X - +375	**325	**304	301	1.89	26	-5 .8.
	X •338	338	··381	390	. • ¢û3	. • 383	0 .8
19	_ 4		T+462	<del></del>	<del>, , , 545</del>		<del></del>
19	X 1373	~~~~~ <del>~~~~</del>					
19 10 11	X +475	53	. • 481	635	1 • 65	, • 66	10 .3
19 10 11 12	X 475 X 1+23	/•53 /1•11	**88	) • 635 ) • 685	1.47	214	-20 1.0
19 19 20 22 22	X +475	53	. • 481	635			

```
..456
..54
                                                                     # • 54
# • 58
# • 775
                                                                                               ..382
..50
                                                                                                                  •5 1.0
0 1.0
                                +643
•582
                                         - 11605
125
                         .X
                                                         1595
                                                                                               ..74
                                                                                                                   5 1.0
                                                         4 • 753
                                                                                  ..765
127
                         X
                                .63
                                           ..685
                                                                                               7787
                                                                     1.918
                                                                                  7.92
                                •73
                                           7183
                                                         7190
                          DATA TCAZ
                                                         / .31,.314,.37,.332,.767,.428,.505,.58,
129
                          0015, 635, 635, 635, 639, 628, 60, 565/
CATA TALP /0,5,10,10,15,
130
                                                       /0+,5.,10+,15+,20+,25+/
131
                           CATA TALPS
                                                         £0.,4.,6.,8.,10.,12.,14.,16.,18.,20./
132
                                                          /-20.,-15,,-10.,-5.,0.,5.,10./
133
                           DATA TOELTS
                           CATA
                                 THACH
                                                          <del>/042082100</del>/
                                                          /.4..8.1.0.1.3.1.8/
                           CATA THACHE
135
                                                          /.4..8.1.0,1.3,1.8/
136
                           CATA THACHS
                                                           / . 4 . 6 . . 5 . 1 . 0 . 1 . 2 . 1 . 4 . 1 . 6 . 1 . 8 /
137
                                                          / +4,:5,.6,.7,.8,.85,.9,.95,1.0,1.1/1.2/
                           CATA THACHS
                             1.3/1.4/1.6/1.8/
139
                                                       <del>/</del>:<del>{$153417.734211</del>334<del>29</del>614261742147427
                           DATA TOUP
140
                                                       /.085,.087,.090,.097,.086,.073,.061,.049/
                           CATA TCLD
141
                           DATA TCPO
142
                            -185-,-165-,-162-,-125-,-100-,-101-,-102-,-104-,-105-,-107-,
143
                             144
145
                              a178+7+194+7+195+7+195+7+194+) a192+7+18#+1+174+7+144+7+110+7
146
                             -130-,-155.,-162.,-155-,-150-,-143-,-134.,-12C.,-105.,=67-/
147
                           ABALP # ABB(ALPMA) #57,296
ABBET # ABB(BETA ) #57,296
148
145
                           IFITIALTATES GO TO 2
                           CELP . DELPIT-57.296
151
                           DELY - DELYAW-37.298
IF(ALPHA+LT+0+) DELP--DELP
IF(BETA+LT+0+) DELY--DELY
135
153
154
155
                            I . ISAVE(1)
                            J. A. 18445 (5).
156
                            K . ISAVE(3)
157
                            CALL FINDITYTALPYSYABALPT
158
                            CALL FIND (J, TDELT1, 7, DELP)
CALL FIND (K, TMACH1, 3, FMACH)
159
160
                                                                   Gn TR 50
Gn TR 60
                            IF(I .NE. ISAVE(1))
161
                            IF TU-VNEV-18AVE (21)
162
                             IFIK .NE. ISAVE(3))
                                                                   GB T9 70
163
                             89-78-80
164
                     50
                             ISAVE(1) . I
145
                             ISAVETET -- U-
166
                     70
                            CANTINUE
                            CALL NTERP (ACNITCHIIITALPIGIJITOELTIITIKITACHI)
CALL NTERP (ACMCGITCMCGI)
-CALL NTERP (ACAPITCAL)
148
169
170
                             I . ISAVE(4)
                     80
171
172
                             W W- 18AVE(S)
                            CALL FIND(1, TALP, 6, ABBET)
CALL-FIND(J, TDELT1, 7, DELY)
IF(1 •NE• ISAVE(4))
173
170
                                                                   Ge T9 150
175
                             1F13 - VEV-18AVE(81)
176
177
178
                                                                    G9 TR 170
                             IF(K .NE. ISAVE(3))
                             Ge TO 160
ISAVE(4) # 1
                     150
 179
                             18AVE (5) --- J
180
                     16C
                     170
                             CANTINUE
181
                            CALL NTERP (ACTYTCH1) 1-TALPYSYUJTDELT1-TYKYTMACH1)
CALL NTERP (ACLNCG-TCMCD1)
-CALL NTERP (ACAB-TCA1)
182
183
                                                                   G8 T9 190
                             IF(K +E9+ ISAVE(3))
                     180
185
                   c
184
```

SW.

```
SET I & J FOR ALPHA # DELTA # 0.0 IN TALP & TPELT1
187
188
189
                         I = 1
TYO
                         CALL NTERP (ACAR, TCA1, 1, TALP, 6, J, TDFLT1, 7, K, TFACH1)
191
                         ACA8(2) 4 ACA8(5)
192
193
                         ISAVE(3) . K
                         CONTINUE
                  190
194
                                    # FUNCTION (ACN, ABALP, DELP, FMACH)
193
                         CN
                         CPCG
                                    # FUNCTION (ACMEG)
196
197
                         CAP
                                    * FUNCTION (ACAP)
198
                         CY
                                      FUNCTION CACY, ARBET, DELY, FMACH)
                         CLNCG
                                    # FUNCTION (ACLNCG)
199
200
                         CYS.
                                    # FUNCTION(ACAB)
                         CAB
                                    - FUNCTION (ACAS FMACH)
201
                         CA & CAP
                                   * CAB - CAB
505
503
                         G8 T8 3
204
                 C
205
                         I # ISAVE(6)
                         J # ISAVE(7)
206
                         K . ISAVE(8)
207
205
                         CALL FIND (I) TALPS 6: ABALPS
                         CALL FIND(J, TMACH2,5,FMACH)
503
                         CALL FINDIK, TALP, 6, ABSET)
210
                         IF(J •NE• ISAVE(7))
IF(I •EG• ISAVE(6))
211
                                                           Ge TE 250
                                                          G9 T6 260
212
                         ISAVE(6) # I
213
                  250
                         CALL NIERP (ACNOTONZOLOTALPOSSOJOTMACHZ)
214
215
                         CALL NTERP (ACMCG, TCMCG2)
                         IFTU NE TSAVE (7)
216
                  560.
                                                           GR T9 270
                         IF(K +EG+ ISAVE(8))
217
                                                           G8 T8 280
                         ISAVETTI W J
218
                  270
                         ISAVE(8) * K
219
                         CALL NTERP (ACY) TON23K3 TALP363 USTMACH2)
550
                         CALL NTERP (ACLNCG TCMCG2)
221
                         I'w ISAVETST
555.
                  280
                         CALL FIND(I, TMACH5, 15, FMACH)
553
                         IFIT BEQU ISAVE 1911
224
                                                           G8 T8 290
                         ISAVE(9) = I
225
                         CALL NTERP (ACAPYTEASYTYTMACHS)
558
227
                  590
                         CONTINUE
                         Ek-
                                    - FUNCTION (ACN; ABALP; FMACH)
228
229
                         CMCG
                                    # FUNCTION(ACMCG)
530
                         CY
                                    # FUNCTION(ACYTABBETSEMACH)-
                         CLNCG
                                    # FUNCTION(ACLICG)
231
535.
                                    <del>ij</del>-F<del>unctiontacapy#Machi</del>
233
                 C
                         I * ISAVE(10)
734
                         CALL FIND(I) THACH3,8,FMACH)
235
                         IF(I VEG 19AVE(10))
236
                                                           Ge TA 350
                         ISAVE(10) = I
237
                         <del>CALL NTERP (ACLP) TCLP) 1/TMACH3/</del>
238
                         CALL NTERP (ACLD, TCLD)
239
                         I . ISAVE(11)
240
                  350
                         J . ISAVE(12)
241
242
                         K . ISAVE(19)
                         CALL FIND(I) TMACH4,5,FMACH)
243
244
                         CALL FIND (J) TALP4710748ALF1
245
                         CALL FIND(K, TALP4, 10, APBET)
                         IF(1 .NE. ISAVE(11))
                                                           GA TM 360
246
                         IF(J .EQ. ISAVE(12))
                                                           Ga TA 370
247
                  360 . ISAVE(12) . J
248
```

249		CALL NTERP (ACMG, TCMG, J, TALP4, 10, 1, TMACH4)
250	37c	IF(1 •NE • ISAVE(11)) GB T9 380
251		IF (K +EQ+ ISAVE(13)) G8 T9 390
525	380	ISAVE(111) + I
253		ISAVE(13) · K
254		CALL NTERP (ACLNR, TCMQ, K, TALP4, 10, I, TMACH4)
255	390	CONTINUE
256	_	CLP # FUNCTION(ACLP,FMACH)
257		CLD • FUNCTION (ACLD)
258		CMG W FUNCTION (ACMG) ABALP, PMACH)
259		CLNR # FUNCTION(ACLNR, ABBET, FMACH)
260		IF(ALPHA +LT + O+0) CN + -CN] CMCG=-CMCG
261		IF(BETA .LT. 0.0) CY+-CY; CLNCG*+CLNCG
262		CMAD+O+
263		CLNAD#O.
264	<del></del>	KETURK
265		EVC

		CATTENDIAL DUTITATION TO CONTRACT TO CONTR	CORYGN/ETG/CPSI,SPSI,SPRI,CPHI,CPHI	「「おおようのもつはておおい」	へ マトエト)のむりゅくにまいり、 マトエト) 2.10m ペーストの	CHECONSTRUCTION (CHECK)	EB118CPS14CPMTA	EGNIGATORIAGININE AGING ACTION	EDDD=CPT1=CPT1+CPT1+CPT1+CPT1+CPT1+CPT1+CPT1+CPT1+	 EGMURCHTI-CHITA-COTTI-COTTI-ACTITI-A ACHCAN	
<del>-</del> 1	ku en	# <b>%</b> 0	-	: hc en	0 =	3.00	4.00	17		600	,

•••	SCBRAUTINE TRSFBS
2	
ന	U
*	DITENSITY DUTINITY DU
<b>M</b> O	COTTOTION
10	TORKING NOTIFIER FOR TORKING BOLD SOUTH BOOK SOUTH BOOK BOOK BOOK SOUTH BOOK
•	(GISE) ZISTORO (GISE)
	8522*C0S(#81S)-
•	BS31#SIN(THTAS)
10	つのベーエトンのもつまの中の
11	8S11#8S22#8g33
12	TOOL BOLLOW TOOL TOOL TOOL TOOL TOOL TOOL TOOL
13	8821#*8512*9533
1 b	
	8832€0•
1.6	RETURK
1.7	

- 0 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
---

CLARALTINE LASERR  THIS SUPRBUTIVE TRATISFARM VISSLE TR TADGET NISPLACEMENTS  FRAM FCS TB FCS, FRAM BCS TA SCS AND CAMPHITE LAS ERROR I  COMMAN/FTS/PRIIJFRIZJRSIZJRSIZJRSZJRSZJRSZJRSZJRSZJRSZJRSZJRSZJRSZJRS
--

-	SCHABLTINE WCALC
	CONT THIS SUPRBUTIVE CALCULATES THE MACH NUMBER
(*	<b>U</b>
77	CIRENSIBN RIP (63)
ı٢	REAL MACH
۷.	COMMON/ETB/FR11,ER12,EB13,5R21,EB22,FR23,FR31,ER31,ER33
•	CRYMBN/MACH/MACH, VSND, UR, VR, WR, VRS, VRX, VW
~	TOYYBY INTEG/1, U. OGO, U. V. W. RITH
σ	CUPYON/F/XXS, XYS, XZS
×1	SPECIC STOKE LICERAL
11	SXM*COSH*CXM*TCGH*SX
0.	
£ 3	
7 7	WARA WAS
ir.	T. W. S. F. F. S. F. F. S. F. F. S. F. F. S. F. F. S. F. F. S. F. F. F. S. F. F. F. F. F. F. F. F. F. F. F. F. F.
16	→ CRANEUR#UR+VR+VR+VR+VR
13	CREBORRY (VRS)
x	₹ A C T E C
19	というと
	- DAG

```
SURRALTINE FRAMEN
                        SUBRRUTINE FRAMON CALCULATES PARCES AND MEMPINTS FOR THE DIFEG SUBROUTINES
                C##
                        DOUBLE PRECISION TIMESTIMES
                       DEAL MACH
DIMENSION MOMO(A), MOMIT(17), MITHI(40)
COMMAN/YOCEQ/AXB, AYR, AZR, CLO, CNP, ALP, AMG, CMG
COMMON/COEP/CAZ, CY, CN, CLP, CMCG, CYCG, CCLD, CMG, CNR, ALPHA, BETA, CMAD,
                       1CLNAC
                        TO
                        COMMON/OD/DELVY,CELVA,DELR,CELROL
COMMON/JUNK/TIME,TIME3,RHA,S,D,SQUW,CAP,TRAP,RAPTM1,RAPTM2,TACT,
11
                       15LOPF1,871,RAPTM3,SLOPE2,872,CTT,CPT,SPT,XLTA,STT,GAPS,GAPSU,
19
                       EGAPSCM,TH
COMMSN/INTEG/I,J,HOHO,P,G,R,HOHI,DELI,DELVP,OFLS,HIHI
14
                        COMPONIEP PROCEDIFF CHEIFF CHEIFF CHEIFFAXBIFF AZBIFF AZBIFF ALBIFPAHBIPHAND
16
                        ALPHARATANZ (WRAUR)
SQUMASQRT (URAURANRAMR)
17
18
                        BETABATAN2 (VR. SGLW)
19
20
                        CAPS. SORMYOVES
                        CAPSOGAPOS
21
                        URPSCUGEPSUD
IF(VRh.EQ.O.) 05 TO 121
                        GAPSCH#GAPSDOD/(2.4VRH)
24
35
                        382 6T 0D
26
                --- IZI GAPSCHEOF
                   155 COVITINGE
                        DELVA+(DEL1+DEL31/2+
रह
29
                        TF(1ACT+EG+210ELVY+(DEL7+DEL1)++8
30
3!
                        IFITIME . GE . TIME 3 IDELROL . COLLVR
                        CEURYDELROLOS7.2987798
CALL AERO (TIME, TIMES, MACH, ALPHA, BETA, DELVP, DEL VY, DEL R.CN, CMCG, CY,
15
33
                       ICYCOTCA27CLP3CLDTCHOTCMADTCKRTCLRADT
34
35
                        CLB . CAPSD . CLD . DELR . FFCLR
                        CMB & CAPSOM#CMC#G#FFCMB
CNB & GAPSOM+CNR+R+FFCNB
16
37
18
                        AXB & #CAPS#CAZ#FFAX8
                        AYB . - GAPSOCY-FFAYB
35
                        SEATHWOMERADE & SEA
40
                        ALBOGAPSDMOCLPOPOFFALB
41
                        APE - GAPSD-CMCG-FFAMB
42
43
                        IFTIRAP.EG.O. OR . TIME.LT . RAPTMITER TO 123
..
45
                        IF (TIME . LE . RAPTM2) THE BLOPE 1 - TIME . BT1
                        46
                        IF (TIME . GT . RAPTH31TH+Q.
47
                        IF (TIME + GT + RAPTM3) IRAP+O
48
                   123 AXRHAXBOTHECTTOCPT
50
                        AYERAYB+TH-CTT-SPT
                        AZBEAZB-TH#STT
51
52
53
                        <del>☆₧₿₩₩₽₽₩₽$₹Т₩Х<u>С</u>Т</del>ġ
                        ANBEANS-TH-CTT-SPT-XLTA
                        RETURN
54
55
                        END
```

PA

•		cugaruting offer
n e.	 * * •	CALBLE PRECISION
ט ב		CIMENSIAM DAG(27), COW(21) SEAL MASS, IX, IV
~		1/EE11,FB12,FB13,EB21,EB22,
,		SEC/AXBJAYBJAZBJCL9, CNB, ALB, AMRJANF, CM?
α		EG/1, J, GC, U, V, W, P, C, R, D9G,
σ		
CI		KVT TRE
11		JUNK1/THALD, I
12		1849,1840/00
13		G/GXE, GYB, 62
- <del></del>	* * U	PESALUT1
it.		G×####1010 * 6
1.5		GY9≭E8234€G
17		り 本の内部 出来 立て
	***	FGUATIONS OF MOTION
6.4		OC#AXE/FASS+RacesateGXB
		IPTTNESCT THOUGHANDSNAVYSEGS 1) COROS
 		CV B A YE/P ASS + D * E # D * C + G Y B
22		DEEXZEVY ASSESSES TO VOCA SESSESSES
63		OP#(ALB+CLB)/IX
		CC=(ANB+Crbt/1/2+p+x+x1v1fx
<b>L</b>		DRE(ANB+CNB)/142=D+D+XINTIA
- 92		CTHTAILTG*CPHI=R*SPHI1/CPSI
27		CPT1mp=D1T1A+0PS1
38		CPS: BRECPT SCASPT!
<b>ن</b>		IF (IRALL. NE.C)DP#0.
30		TFTIRGET NEGOTPHO:
31	* * U	LBCITY
25		E021#
99		DY#EB12*U+E822*V+E832*W
470		E823*1
ි ස ප		24013
36		END

M

SLARGELTINE METO		COURTE PRECISION TIMES	CIMENSIAN DUM (PR) DUMY (A)	SEAL PACH	COMMON/MO/GERALT, TA, TSRAD, RHASL, ARG1, ATMAL, RSTA?,	IRHAR, ARG2, Ga, TMAL	COPMAN/LUNK/TIMES, TIMES, PHAS, DUM	CORPARATACH, VSRO, DUPY	1F(GFBALT.GT.36C89.2389) GB TA 12	TMPL #T8+TGRAD*GEPALT	RHG*PHBSL*(18/149L)**ARG1	©工化 * 00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	VSND#SGRT(1.4.4RSTAR*TMBL/kT~BL)	ਰ 1 ਮ ਤਿ	12 CBNTINUE	ARG2##69##148[#[6E8ALT#36389#2389]/(RSTAR#TM9L)	RHG#RIBB*EXD(ARG2)	13 RETURN	してい
h	٣	7	ĸ	٧	2	ŧΧ	(ľ	X I	·	<u>ر</u>	(C)	4	r.	16	17	or or	6	ca	21

```
SUBROLTINE SEEK
                       THIS SUBROUTINE DETECTS TARGET WITHIN THE DETECTION RANGE OF SEEKERA
                      TARGET WITHIN THE FIELD OF VIEW, S-A-H, SEEKER WITHIN LINEAR MANGE
                      DOUBLE PRECISION TIME, FOTSAM, TIMEA, DT, DTA, TST, TME, SPER
 4
                      CIMENSIAN CAT(14), RAT(49)
COMMON/STUFF/DELXS, DELY9, DELIS
                      COPPON/JUNKE/SRNGE; IFUFO, IACG, ROFT, YAWERO, PITERO, PHPOV, BA, RNGLIN,
                      IPITYANSCAREDA NULSKRABRSARFLECT, NULLAKAGE
                       COPPONTINESKRIPTYERR, YAWERR
10
                      COMMON/JUNK/TIME
                      COMMONYINTESTI, J. DTRK; CAT. THTAS, THASD, PSIS, RAT
12
                      COMMON/TT/FSTSAM,TIMEA,D TA,TST,TMF,SPER,TSAM,DO,JMAX,IPRINT,TZ
SRNGESSCRT(DELXS+DELXS+DELYS+DELYS+DELZS+DELZS)
13
14
 1.
                      CATA IACQ1/0/
                       IPTIPLPAVEG.CING TO SEC
                       IF (TIME+LT+T2)09 TO 105
                       IFITACQ1+NE+0188"T8 11
 2*
                      1F(14CG+NE+1)08 T8 10
 10
                      FSYSAMUTIME
 A.
                   In IF(IACG.EG.2) IACG1-1
 8.
                      CONTINUE
                      GO TO (565,107), TACG
18
19
                  SED CONTINUE
                       1F(ACG.EG.2)68 TO 107
80
21
                      FETSAPUTIPE
                      IF(TIME+GE+TIME+)GB TS 545
22
               IP(TIMECTIVE) CO TO TO TO TO THE MITHIN PHEOV AND ROET COMES ACQUISTION (IACQUE) WHEN TARGET IS MITHIN PHEOV AND ROET
71
24
15
                 '585' COKTINUE"
26
               C
                      Con
28
74
                      IP(SGRT(PITERR++2+YAMERR++2)+GT+00872664)00 TO 101
30
                       TPTSGRTTPETSHEETHYMESTHYASISTERSATOR TO 101
n
                  567 CONTINUE
                      PRINT EVERY JHAX INTERVALE
33
                      JPAX-1024
 1.
                       CT#OTA
35
                      OTRK-SHOL (DY)
36
37
                      1400+2
38
                       IPRILTUZ
               PRINT 90005 - 90005 FORFAT(/,2X, IACQUISTION!)
19
40
41
                      <del>00 15 103</del>
42
43
               107 CONTINUE
44
                      PITERRUATAR2(-DELZS, DELXS)
45
                      YAWERRWATANZIDELYS, SORTIDELXSODELXSODELZSODELZSIDE
46
                      LOSS-SF-ACQUISTION
67
45
                c
                      IF(SCRT(PITERROPITERROYAMERROYAMERR),GT.PHFJV)G6 TO 101
5¢
                      PITYANSCOSGRT (PITERTOPITERT + YAKERD + YAKERD)
51
                      IF(FITYAMBG.LE.G.S/R2DINULSKRWE
52
                  103 CONTINUE
                      SAMPLE AND HOLD IF PRIBARETINE IS INCLUDED AFTER STATEMENT 102
TRYOTIME-FRISAM
53
54
                      TSAMETST-THE
55
                      IF (TSAM-8PER) 104, 104, 104
 1 •
                  104 THE THE -BPER
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IF(SCRT(PSIS+PSIS+PITERD*PITERR),GT.PGF70108 108 IF(SCRT(PSIS+PSIS+PITERR),GT.PGF70104 TO 108	CALL SEEKEK(SKKSP) RFLFCTVPLTFRRFFTTERS)	CALL SEEKER(SRAGE, RFLFCT, YAWFRR, YAWFRR)	TITE TO THE THE TO THE	YAKERBHYAKERR	GG TR 109	101 IACG#NULL#KAGE#1	10X YAKEKOHO*	PITER0#0•	109 CONTINUE	U	C** CREKER WITH LINEAR DANGE	IF (ABS(YAKERA).GE, RNGLIH)YAWFRBESIGN (RNGLIN, YAMERA)	1		CN C
ore	19	90	رع	79	ı,	66	- 49	x 9	69	7.	71	72	73	٠ ا د	5.

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•		ALTERIAL PROPERTY OF THE PROPE
	خ	SURRAUTINE EDSKRGYRA
_		THIS BUBROUTINE CARSTRUCTS THE SPEKER GADA HACET EQ.
3	<u> </u>	
		DOUBLE PRECISION TIME
5		REAL KT;KT10,KT20,LAMPR,LAMYR
i•		REAL KO, KY30
6		LOGICAL FLOA/ TRUE ./
7		COMPON/INTEG/KUTTA,NX,DTRK,U,V,L,P,G,R,PHT,THTA,PS1,X,Y,Z,RTHTA,
8		1RPS1.THTAS.THASD.PS1S.PS1SC.OHEGA.TXED.PXFC.PEF.YEF.DEL1.CELVP.
7		EQELIZZODELIZZODELYPZODELIZZRLAMYZRLAMPZRPHIGZDPHIOZDDZDVZDVZDWZDPZOGZDRZ~ ~
10		3DPHI,DTHTA/DPSI,CX,DY,DZ/DRTHTA/DRPSI,DTHTAG.CTHASD/DPSIS,DPSISD,
11		#D&HEGA,DTX&9,DPXFD,DPEF,DYEF,DDELP1,DNELPP,D9FLP3,90DEL1,CDUELP,
12		5DCDEL3,DRLAMY,DRLAMP,DR#H1G,DDPH10
13		COMMONATIME
14		COMMON/TT/FSTSAM, TIME4, DT, DTA, TST, TMF, SPER, TSAM, DO, JMAX, IPRINT, T2
15		COPPONYPERVYOMEGY, BMEGZ
16		COMMON/BOB/RELIKY, KT10, KT20, LAMPR, LAMYR, RTM, RTM, IN, REGE, ED1, FLGA,
779		TRBAJECAJGSA
18		C0MM0N/875/8511,8512,8513,8921,8522,8523,8531,8532,8533
19	-	COMPON/JUNKE/SRNGE, IFUFOFIACG, ROET, VAMERO, PITFRO, PHFOY, BA, RNGLIN,
20		481 YALKOADON WHI OND DOD BELOOK WILL MAD
1.		1P1TYANSQ,R2D, NULSKR, ERS, RFLECT, NULL, KAGE
_		COPPON/OF/RS, RR, H, X, B, KTSC
21		DPH[0eDPH]
52		TRBCV125./R2DJIFCABSCOPHTOJ.AT.ASLIDPHTOVSTAN(RSL.JOPHTO)
23		IF(TIME+LT+TR)GB TB 5005
[4	<u> </u>	
20	C++++	CHECK FOR NULL SFEKER
30		IFTTIPE+GT+10++AND+RTH+LT+RTPIN1GB TB SOUD
4.		IF(NLLL+EG+2)G8 T8 5000
50		THULES
é♥		REGE = SQRT (THTASOTHTASOPSISOPSIS); IF (RSGE - LE - 0 - 5 / R2D - AND - IACR - EC - 2)
7* ***		INULUSZ — TO TO TO THE TOTAL TOTAL TO THE TOTAL TO THE TOTAL TO THE TOTAL TO THE TOTAL TO THE TH
<b>() ●</b>	C++++	F(SGRT(PITERR+02+VANERR+02).GT+PMFGV)IACGPNULL+1
31	3000	TFTTACG*EG*TYNULL#1
100	C	
118-		-IF(NULLIEGE)LAMPRELAMYRE():
15•	c	
24		-1F(NULL) = EG = 1 1 KT = KT 20
25		IF(NULL.EG.2)KT-KT10
76		TPTABSTREAMY) #GT. #87266#1REAMY#STGNT.8726##3REAMY)
10		*GBKT*KT30
Ž**		OFEGYaKGAYAWERO
3•		OFEGZ=+KG+F1TERO
***************************************		IF (ARRIGHEDZ) + GT + + O169625 ) - AMEGZ#81GN (#O1AR625 7 PEGZ)
50		1F(ABS(BMEGY)-GT++0165625)
- 64		FWALLESTON ESTATEMENT TO THE TERMINATION (*01V2952) ULFOAT
7.		LAMYR-OMEGY/KT30
8#		1F(ABS(LAMYR)+GT++1749329)LAMYRWB1GM(+1745729,LAMYR)
9•		. (ABS(LAMPR) • GT • • 1745329) LAMPR • SIGN( • 1745329, LAMPR)
45	Ċ	SEEKER GYRO FOR ED
46	C	
47	5705	CONTINUE
48		IF(TIME+LT+ED1)00 T9 6670
49	-	1F(+NOT+FLG4)00 TO 4670-
<b>5</b> 0		KAGE=21FLG4+.NOT.FLG4:PRINT 90006
51	-3000g.	FORPATI/JUNGAGE BYRG FOR ROLL TO VERTICAL 1)
52	6670	CONTINUE
53		IFITIME OTVED TO AND STACKS NEW POARHOUTPUP TO WEST HEAGEN
54		IF(IACG.EG.2)KAGF.2
55		G5AV#981 *#+8322*C+8323*R
56		R6A+8531+P+8532+G+8533+R
57		00 To(5200,5201),KAGE
		and the same of th

.

ជ	Ç	CAGE
5^	Č	- Chair
61	5200	CTHTAS==1C++THTAS; CPSIS==10.*PSIS GB TA 5203
63 63	5201	68 TA(5202,5204), IACC
64	C	
65	r	UNCAGE
66	۲	
87	<u>C</u>	FRE GYRO
68	Ċ	
<b>*</b> *	5202	DTLTA9=THASD-GSA/CBS(PSIS)
2*		DFSIS*FSISD=RSA
3.*		CTHASC*(*H*PSISD=RB*THASD)/B
4*		CPSISC=(=RR+PSISD+H+DTHASC)/A
7:		GU TE 5203
72	C	
73	Č Č	TRACK
74	<del></del>	
\$ <b>*</b>	5204	CTHTAS#THASD#GSA/CBS(PSIS)
2 #		CPSIS*PSISD*RSA
7. 1	<del></del>	CTHASUST #H*PSISD=RBSTHASU+BHEGY17B
4 *		CPSISO = (AMEGZ-RR*PSISD+H*THASD)/A
77	5203	RETURN
7 <sup>2</sup>		EVC

```
SUBPOUTINE EDAP
                    THIS SUBROUTINE CONSTRUCTS THE AUTOPILOT MODEL FOR ED VERSION
·y
              74
 3
                    BOURLE PRECISION TIME
Ŧ
                     LOGICAL FLOSY. TRUESTAFLG27. YRUE. JAFLG37. YRUE. 7
 9
                     COMMON/JUNK/TIME
                    COPPRN/53/81/92/53/54/55/56
                    REAL POLES(01)/+20./
                     REAL KPD, KG, KM, LAMBI, LAMPR, LAMYR, KG
                    COMMON/OUTAP/YEG, REG, PEG
                    COPPON/BOW/RSL,KY,KT10,KT20,LXPPR,LXPYR,RYM,RYMYN,RSGEJED1,FLG4/
10
                   1RSA, ED4, GSA
11
                    COMPONIUNKZ/SRNGE, IFUFO: ACG, RDET, YAWERS, PITFRS, PHFOV, BA, RNGLIN,
12
                    1PITYANSGARZO, NULSKR, BRS, RFLECT, NULL, KAGE
13
                    COMMON/ARROW/PHIG, FLG1, FLG2, FLG3, REF, RFL, YED, PED, THROS, PSRB9,
14
15
                    1THBS, PSBS, GBLV, PEFL, KPD, KQ, KM, KG, LAMBI, FOLES
                     16
                    1RPSI, THTAS, YHASD, PSIS, PSISD, OMEGA, TXFD, PXFC, PEF, YEF, DEL1, CELVP,
17
18
                   RCEL3,DDEL1,DDELVP,DDEL3,RLAMY,RLAMP,RPHIG,DPHIO,DU,DV,DW,CP,DG,DR,
15
                    3DPF1,CTMTA,DP51,DX,DY,DZ,CRTHTA,DRP51,DT4TA6,TTHASD,DPS1S,DPS1SD,
                   *COMEGA, DTXEO, DPXED; DPEF, DVEF, DDELP1, DDELPP, DDELP3, DDDEL1, DDUELP,
10
                   SOCOEL3, DRLAMY, DRLAMP, DRPHIG, DDPHIO
21
                    COMMON/TT/PSTSAM, TIME4JOT, CTA, TST, TME2SPER, TSAM, DCJ JMAX, IMINTYTE
72
              C
                    RULL AUTOPILOT
23
74
                     IFITIME.GE.EDAIGS TO 5025
25
16
                    PHIGE-DPHIGEST-75% PSISHE2 **
                    40 TO 5030
27
                    IPTIFUFO EQUETO TO SUES
28
29
                    IF(IACG-EG-2)G8 T6 5025
30
                    PHIGH-OPHIGESIN75. #PSIS#$2 ---
                    GO TO 5030
                    "[FT#N6T+FL@1108"T9"8667"" "" "" "
                    PRINT 9000211PRINT-21FLG1#-N8T-FLG1
33
34
              SUGUE FORPATIYAEX, TROLL HOLD'S
35
                    CONTINUE
              4467
                     DRUAPY-10--DPHIO-
36
                     PHIGO-DPHIO-SI-RLANY-S3
37
38
                    LEAD LAG ROLL AUTOPILOT REG/PHIGHKPD+(S+5)/8+12.5)
39
              Cos
               SUSU-CONTINUE
80
                    CALL FLTR (PHIG, RPHIG, DRPHIG, REG, 12.5, 5. KPD)
41
                    RFL#7*/RED/1FtAB8(REG)+GT+RFL)REG+91GN(RFL)AFG)
42
43
              C
44
              · Caw
                    PITCH TAN AUTOPILOT
                    RATE DAMPING OF GIMBAL ANGLES THRBS/THTAS=KG+S/(+GO67+3+1)
45
              C++
                     CALL EDRTOAMP(THTAS)TXED)DTXED)THRB9;POLES(01);KG;KM;THCS)
46
                    CALL EDRYDAMP(PSIS, PXED, DPXFD, PSRBS, POLES(01), KG, KM, PSBS)
47
                     INPUT TO GUIDANCE PILTER PED, YED
48
              C
               5065 CONTINUE
49
50
                     PEDWEAMPR ---
                     YEDOLAMYR
51
                    GUIDANCE PILTER PEFYPEDUKGYLIJUSUI
37
53
               5075 CONTINUE
                    CALL FTLG(PED, PEP, DPEP, KG, 10+)
54
55
                    CALL FTLG(YED, YEF, DYEF, KG, 10.)
56
                    サモテレッドモア・じょべき!
                    GBLV+8./RZD
57
                     38
                     IF (ABS(YEF) . GT . GBLV) YEF . SIG" (GBLV, YEF)
59
                     IFITTHE LTVT2+ OR. TACG. EC+1170 TO 5100
60
                     IF (+NOT+FLG2) GO TO 6668
61
                    PRINT 90003; IPRINTUE: PLOZ##NOT.FLG2
62
```

63	かほ でいししめ	GOOG HORKT(//BX), (LATEBAL FORE)
44	76A X A C B	SATINUF
<b>6</b> 5	TO TO	63 TP (5090,538 <sup>5</sup> ), N'1LL
KK - 73	Be DROH	にの次で「アのたち= アクロアロチーエアのキ・ハイ・コン・ストラー・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・
67		₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩
4.7	ąς	3b TA 5100
なみ	41 年まじょ	5,585 [F(.* PT.FLG3)58 TO 6669
75	a	PHINT 90004; PPRINT #21FLG3 * . PT. F. 33
7:	81 TOUL6	9-104 FBEMAT(//2X//GLIDANCE ENABLE!)
73	45 F B B B B B B B B B B B B B B B B B B	GEED CONTINUE
73	a A	PEG*(PEFL*THR!S*C4)*SS
74	<b>₩</b>	<b>★ 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1</b>
75	#100 1F	<pre><!--!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!</td--></pre>
76	<u></u>	IF(A¤S(YEG).GT2094394A)VEC#SIG\("?094394A,YFG)
77	Er Cr	4度手しな人
	1111	

1	SUPRAUTINE FLTR(X,Y,Z,A,B,C,D)
2	Z=X=b+A
3	A={C+Y+Z}#D
4	REYURK
5	EVC

1	SUARBUTINE EDRTDAMP(X,Y,Z,A,B,C,D,E)
2	Z==*(C*X*Y)
3	A=B+(C+X=Y)
4	Ealla (X+Y)
ĸ	RETURN
4	ĔVD

1	SUBRAUTINE FTLG(X,Y,Z,A,B)
2	Z=¤*(A*X*Y)
ৰ	RETURN
4	ENL

	ITS SUBRBUTINE CONTAINS THE CONTROL SYSTEM, CANARDS FOR EACH PLANE ON BANENS SHAFT, SECOND ORDER ACTUATOR MODEL  PENSION ACTICAT, ACTOICAT), ACTUATOR MODEL  PENSION ACTICAT, ACTOICATOR ACTUATOR  TYANSGIRAD, NULSKRIBRS, RFLECTINULLIKAGE  TYANSGIRAD, NULSKRIBRS, RFLECTINULLIKAGE  PPPN, FOUTAF/YEG, REG, PEG  PPPN, INTEG/IJJ, ACT, DEL1, DELU, DDEL1, DDEL1, DDELYP, BOELS, ACTOICE, PROBELS, ACTR  PPPN, JUNKYTIME, TIMES, RHOSS, D, SQUW, GAP, IRAP, RAPTHI, RAPTHE, IACT,  OFEL, BTI, RAPTHE, SLOPEZ, CTT, CPT, SPT, XLTA, STT, GAPS, GAPSO,  PSOM, TH
	SECOND ORDER ACTUATOR MODEL T(24), ACTO(27), ACTR(4) /SRNGE, IFUFO, IACO, RDET, YAWERO, PITERO, PHFOV, BA, RNGLIN, JNULSKRJERSJRFLECTJRULLIKAGE /YEG, REG, PEG /YEG, REG, PEG //TIJ, ACTIDEL1, DELVF, DEL3, DOELVP, DOELS, ACTR //IME, TIME3, RHO, S, DO, SGUW, CAP, IRAP, RAPTHI, RAPTHE, IACT, /APTHOS, SLOPE2, BT2, CT1, CP1, SP1, XLTA, ST1, GAPS, GAPSO,
	T(24), ACTG(27), ACTR(4) /SRNGE, IFUFO, IACO, RDET, YAWERO, PITERO, PHFOV, BA, RNGLIN, JNULSKRJERSJRFLECTJHULLIKAGE /YEG, REG, PEG /YEG, REG, PEG //TIJJACTJDEL1, DELVF, DEL3, DOEL VPJODEL3, ACTR PJODELP3, DODEL1, DODELP, DODEL3, ACTR TIME, TIME3, RHO, SJO, SGUWJGAP, IRAPIHAPIRAPTHO, IACT, APTM3, SLOPE2, BT2, CT1, CP1, SP1, XLTA, ST1, GAPS, GAPSO,
	/SRNGE,IFUFO,IACO,RDET,YAWERO,PITERO,PHFOV,BA,RNGLIN, JNULSKRJERSJRFLECTJNULLJKAGE /YEG,REG,PEG //YEG,REG,PEG //JJJACTJDELTJDELVFJDEL3JDDELTJDDELVPJDDEL3JACTO, //JJJACTJDEL1JDDELPJDDELTJDDELVPJDDELSJACTR PJDDELP3JDDDEL1JDDDELPJDDELTJARPJRAPTHIJRAPTHAZJACTJ TIMEJTIME3JRHGJSJDJSGUWJGAPJRAPTHIJRAPTHAZJACTJ APTM3JSLOPEZJRHGJSJCTTJCPTJSPTJXLTA,STTJGAPSJGAPSD,
	JNULSKRJERSJRFLECTJNULLJKAGE /YEG,REG,PEG //JJJACTJDEL1JDELVFJDEL3JDDEL1JDDELVPJDDEL3JACTU, PJDDELP3JDDDEL1JDDDELPJDDEL3JACTR FINEJTIME3JRHGJSJDJSGUWJGAPJRAPTHIJRAPTHAZJACTA APTM3JSLOPEZJRTZJCTTJCPTJSPTJXLTAJSTTJGAPSJGAPSD,
	/YEG,REG,REG //IJJACTIDELLIJDELVPJDELBJDDELIJDDELVPJDDELBJACTU, PJDDELPBJDDDELIJDDDELPJDDDELBJACTR TIMEJTIMEBJRHGJSJDJSGUWJGAPJIRAPJRAPTHIJRAPTHZJIACTJ APTMBJSLOPEZJBTZJCTTJCPTJSPT/XLTAJSTTJGAPSJGAPSD,
	713JACTJDEL1JDELVPJDEL3JDDELIJDDELVPJDDEL3JACTU, PJDDELP3JDDDEL1JDDDELPJDDDEL3JACTR TIMEJTIME3JRHGJSJDJSGUWJGAPJRAPJRAPTHIJRAPTMZJIACTJ APTM3JSLOPEZJBTZJCTTJCPTJSPTJXLTAJSTTJGAPSJGAPSDJ
	P.DDELP3.DDDEL1.DDDELP.DDDEL3.ACTR TIME.TIME3.RHG.S.D.SGUWJGAP.IRAP.RAPTH1.RAPTH2.1ACT. APTM3.SLOPE2.BT2.CTT.CPT.SPT.XLTA.STT.GAPS.GAPSD.
2 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	TIME, TIMES, RHO, S, O, SQUW, CAP, IRAP, RAPTHI, RAPTHE, IACT, APTHS, SLOPES, BT2, CT1, CP1, SP1, XLTA, ST1, QAPS, QAPSO,
1.5.1.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2.	APTM3, SLOPE2, BT2, CT1, CP1, SP1, XLTA, ST1, QAPS, QAPSO,
557-8	DEL1m60.*(60.*(YEG-REG=DEL1).DDEL1)
	OELP#50*#150*# (PEG#DELYP)#DDELVP)
	DEL3#60.*(60.*("YEG#REG#DEL3)"DDEL3)
	(1ACT+EG+2)ODOEL1#60+*(60+*(REG+YEG+DEL1)+DOEL1)
90	)ODOFL3#60.*(60.*(REG+YEG*DEL3)*DOEL3)
1.6	Q.
90	
ないもほん	
19 END	

Alight (FILE, 1), (FORMAT, U), (RSIZE, 202), (FSIZE, 240)

Alight (FILE, 1), (FORMAT, U), (RSIZE, 202), (FSIZE, 100)

ASSIGN (MISI, BT, X6)

FRETRAN SI, GM, NS, BC

BLACO (TEMP, 500), (LIP, USER, SYSTEM)

PORT (FILE, BT, GO, EOD)

I SREF UL 7DPT

U SREF UL 7DPT

U SREF UL 7DPDT

LHACTIG WAS COMPLETED

WARNING: UNSATISFIED REFIS

REWIND 9TARC

ROV

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	SNS	BT2	LT.	EDO	E03	GF GF	OXHICO	IRBULDC	XTHO	×	<b>4</b> 0	ror You	,	X A US	PRIMAX	RAPPHI	RLAND	VRATE	 	<b>83</b>	SFO	50 10	8710	SF15	88	106	THOLD	THOLD	71461	10 X	
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	RIBL	80 82 83	ST	Δ	203	FFALB	87×44	S S	C IFUFB	888	177	RVBIAS	X	¥	NUNN	FILLER	ATO.	RLAPY	¥	<b>318</b>	• • • • • • • • • • • • • • • • • • •	Ci de Ci	SFY	SF12	Staves	108	1	X	1101	1101	111111
EXECUTION	00560	10.000	1.0000	13,000	0254.5	10,000	1 • 0000	.21817			184.25	20000	1 10000	000000	02,11,0	1.0000	7000.0	00000	0.0001	1.0000	1.0000	100.00	15.000	20,000	F 11.938	1.8000	8 - 0000	13080	19500	030000	0.0000
BEGIN EXEC	H	* X	100	DA BUTT		KT10	FFC	>6.540	TOLK	a XV		× ×	BAYAS	• ×			RCET	118d	Alak	- 6K	25	381		2145	ST 89 E2	202	12	THIAC		41750	XI.A.

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